表

表1．1—1　作業管理委員会と調査団メンバー

Name and Position	Designation/Assignment
ADVISORY COMMITTEE	
Hidehiro Sadakane, MOC	Chairman
Yoichi Takeuchi, MOC	(Chairman until Dec. 1989)
Izumi Furukawa, MOC	Member
Katsuhide Yoshikawa, MOC	Member
Naoya Matsumoto, MOC	Member
Akira Mizobuchi, JICA	Coordinator
Tomiaki Ito, JICA	Coordinator
STUDY TEAM	
Katsuhisa Abe	Team Leader
Makoto Migita	Assistant Team Leader (Flood Control and Drainage Planner)
Susumu Heishi	Non-structural Measures Planner
Yuji Morioka	Urban Planner
Masahiro Asada	Hydrologist/Hydraulics and Water Quality Analyst
Kimihiko Kotoo	Geologist/Soil Mechanics Engineer
Katsuhiro Ikari	River Structures Planner
Takashi Furukawa	Structural Design Engineer
Atsuya Saisho	Construction Planner/Cost Estimator
Yuzuo Mizota	Operation and Maintenance Planner
Kimio Shimomura	Project Economist
Munemori Tada	Financial Expert
Youichi Iwai	Social and Environmental Impact Analyst
Toshiki Kuroiwa	Survey Expert

NOTE MOC : Ministry of Construction, Japan
JICA: Japan International Cooperation Agency

表２．１－１　GDP と一人当たりのGDP の成長目標

Item	Estimate 1986	Targets 1987	1988	1989	1990	1991	1992	Annual Average 1987-92
1. Gross National Product								
At constant 1972 prices (billion pesos)	89.4	95.3	101.9	108.6	116.2	124.3	132.7	113.2
Growth rate (%)	1.1	6.5	6.9	6.7	7.0	6.9	6.7	6.8
At current prices (billion pesos)	619.6	697.3	811.8	927.3	1,075.7	1,253.2	1,438.0	1,033.9
2. Inflation Rate (%)	2.0	5.2	8.7	7.0	8.3	8.9	7.4	7.6
3. Per Capita GNP								
At constant 1972 prices	1,597	1,661	1,734	1,808	1,891	1,977	2,064	1,856
Growth rate (%)	-1.3	4.0	4.4	4.3	4.6	4.5	4.4	4.4
At current prices	11,063	12,157	13,825	15,430	17,497	19,934	22,378	16,870

NOTE : Estimates and targets as of 5 November, 1986

SOURCE: NEDA and NCSO

表2．3－1　NCR の人口（1948－1980）

City/ Municipality	1948	1969	1970	1975	1980
NCR	1,569,128(100.0)	2,462,488(100.0)	3,966,695(100.0)	4,970,006(100.0)	5,925,884(100.0)
Manila City	983,906(62.7)	1,138,611(46.2)	1,330,778(33.5)	1,479,116(29.8)	1,630,485(27.5)
Caloocan City	58,208(3.7)	145,523(5.9)	274,453(6.9)	397,201(8.0)	467,816(7.9)
Pasay City	88,728(5.7)	132,673(5.4)	206,283(5.2)	254,999(5.1)	287,770(4.9)
Quezon City	107,977(6.9)	397,990(16.2)	754,452(19.0)	956,864(19.2)	1,165,865(19.7)
Pasig	35,407(2.3)	62,130(2.5)	156,492(3.9)	209,915(4.2)	268,570(4.5)
Las Pinas	9,280(0.6)	16,093(0.7)	45,732(1.2)	81,610(1.6)	135,514(2.3)
Makati	41,335(2.6)	114,540(4.7)	264,918(6.7)	334,448(6.7)	372,631(6.3)
Malabon	46,455(3.0)	76,438(3.1)	141,514(3.6)	174,878(3.5)	191,001(3.2)
Mandaluyong	26,309(1.7)	71,619(2.9)	149,407(3.8)	182,267(3.7)	205,366(3.5)
Marikina	23,353(1.5)	40,455(1.6)	113,400(2.9)	168,453(3.4)	211,613(3.6)
Muntinlupa	18,444(1.2)	21,893(0.9)	65,057(1.6)	94,563(1.9)	136,679(2.3)
Navotas	28,889(1.8)	49,262(2.0)	83,245(2.1)	97,098(2.0)	126,146(2.1)
Paranaque	28,884(1.8)	61,898(2.5)	97,214(2.5)	158,974(3.2)	208,552(3.5)
Pateros	8,380(0.5)	13,173(0.5)	25,468(0.6)	32,821(0.7)	40,288(0.7)
San Juan	31,493(2.0)	56,861(2.3)	104,559(2.6)	122,492(2.5)	130,088(2.2)
Taguig	15,340(1.0)	21,856(0.9)	55,257(1.4)	73,702(1.5)	134,137(2.3)
Valenzuela	16,740(1.1)	41,473(1.7)	98,456(2.5)	150,605(3.0)	212,363(3.6)

NOTE : Figures in parenthesis are percentage composition to the NCR total

SOURCE: NSO (1980 Census)

表2．3－2　フィリピン国とNCR の労働参加率と就業率

Unit: Thousand in the number of persons

Year/Area	Labor Force Participation Rate (%)	Total Labor Force	Labor Force by Employment Status			
			Employed		Unemployed	
			Number	Percent	Number	Percent
Philippines						
1980	59.8	17,308	16,434	95.0	874	5.0
1981	61.7	18,423	17,452	94.7	970	5.3
1982	60.1	18,474	17,371	94.0	1,102	6.0
1983	64.1	20,310	19,212	94.6	1,099	5.4
1984	64.2	20,969	19,673	93.8	1,296	6.2
1985	63.4	21,318	19,801	92.9	1,517	7.1
1986	63.8	22,067	20,595	93.3	1,472	6.7
Average	62.4	19,838	18,648	94.0	1,190	6.0
NCR						
1980	53.3	2,058	1,843	89.6	215	10.4
1981	54.6	2,170	1,918	88.4	252	11.6
1982	55.7	2,280	1,980	86.8	300	13.2
1983	55.0	2,320	2,038	87.8	282	12.2
1984	60.0	2,647	2,172	82.0	475	18.0
1985	59.5	2,723	2,121	77.9	602	22.1
1986	53.6	2,539	2,049	80.7	490	19.3
Average	56.0	2,391	2,017	84.7	374	15.3

SOURCE: NCSO

表２．５－１　PAGASAによる熱帯性低気圧の分類

Classification	Wind Velocity
Tropical Depression	below 16.9 m/s
Tropical Storm	17.5 to 24.2 m/s
Severe Tropical Storm	24.4 to 32.5 m/s
Typhoon	more than 32.5 m/s

表２．７－１　国民総生産と地域総生産（１９７２年価格）

Year	GDP		GRDP (NCR)		Contribution of NCR to GDP (%)
	Amount (mil. P)	Growth (%)	Amount (mil. P)	Growth (%)	
1980	92,706		29,294		31.6
		3.78		4.19	
1981	96,207		30,521		31.7
		2.90		3.24	
1982	98,999		31,511		31.8
		0.93		2.28	
1983	99,920		32,231		32.3
		-6.00		-9.23	
1984	93,927		29,256		31.2
		-4.39		-9.02	
1985	89,803		26,618		29.6
		1.08		0.05	
1986	90,770		26,631		29.3
Average	94,618	-0.28	29,437	-1.42	31.07

SOURCE: National Accounts Staff, NEDA

2．7—2　セクター別NCR 地域総生産

Sector/ Subsector	1980 Amount (mil. P)	1980 Growth (%)	1986 Amount (mil. P)	1986 Growth (%)	Average, 1980-86 GRDP (mil. P)	Average, 1980-86 Percent (%)	Average, 1980-86 Growth Rate (%)
INDUSTRY	15.25	52.0	13.37	50.2	15.2	51.7	-2.0
Mining	-	-	-	-	-	-	-
Manufacturing	12.26	41.8	11.60	43.6	12.4	42.0	-0.8
Constructions	2.44	8.3	0.90	3.4	2.2	7.4	-12.8
Electricity, Gas and Water	0.55	1.9	0.87	3.3	0.7	2.4	7.9
SERVICES	14.04	48.0	13.26	49.8	14.2	48.3	-0.8
Transport, Communication and Storage	2.04	7.0	2.2	8.3	2.2	7.4	1.3
Trade	2.91	9.9	3.77	14.2	3.4	11.5	4.5
Finance and Housing	3.31	11.3	1.12	4.2	2.5	8.5	12.4
Other Services	5.79	19.8	6.17	23.2	6.2	20.9	1.2
TOTAL	29.29	100.0	26.63	100.0	29.4	100.0	-1.4

NOTE : Figures may not add up to totals due to rounding

SOURCE: National Account Staff, NEDA

表3．1－1(1/2) １９８６年土地利用状況

UNIT : km2

SUB-BASIN	TOTAL AREA	RESIDENTIAL/COMMERCIAL			INDUST-RIAL	FISH POND	FOREST	OPEN SPACE	AGRICUL-TURE
		LOW D.	MID. D.	HIGH D.					
(MEYCAUAYAN)									
ME- 1	23.67	1.64	0.00	0.00	0.00	0.24	21.57	0.09	0.13
ME- 2	15.06	2.12	0.08	0.00	0.06	3.27	6.13	3.24	0.16
ME- 3	21.81	8.60	0.06	0.00	0.37	0.41	9.46	2.83	0.08
ME- 4	29.23	3.24	0.00	0.00	1.02	16.32	6.69	1.65	0.31
ME- 5	9.32	1.63	1.15	0.00	1.79	3.75	0.73	0.19	0.08
ME- 6	24.52	4.74	0.07	0.00	0.32	12.06	4.31	2.46	0.56
ME- 7	8.82	0.85	0.00	0.00	2.04	3.15	0.37	1.94	0.47
ME- 8	17.81	3.23	1.23	0.00	3.75	6.87	0.00	2.47	0.26
ME- 9	18.42	5.42	0.23	0.89	0.74	10.31	0.00	0.83	0.00
SUB-TOTAL	168.66	31.47	2.82	0.89	10.09	56.38	49.26	15.70	2.05
(MALABON-TULLAHAN)									
MT- 1	25.82	0.06	0.00	0.00	0.00	0.00	25.76	0.00	0.00
MT- 2	13.38	5.78	1.18	0.00	0.00	0.39	2.35	3.64	0.04
MT- 3	20.08	7.04	0.14	0.07	2.98	4.48	1.14	4.12	0.11
MT- 4	9.97	0.00	3.42	1.58	2.03	1.63	0.00	1.31	0.00
SUB-TOTAL	69.25	12.88	4.74	1.65	5.01	6.50	29.25	9.07	0.15
(PASIG/MARIKINA)									
PM- 1	277.66	0.00	0.00	0.00	0.00	0.00	277.66	0.00	0.00
PM- 2	97.53	1.24	0.00	0.00	0.00	7.12	86.11	2.31	0.75
PM- 3	137.01	6.26	1.12	0.31	0.96	9.32	99.64	12.49	6.91
PM- 4	6.18	2.86	0.27	0.26	1.28	0.31	0.00	0.57	0.63
PM- 5	11.33	6.35	0.53	0.00	2.27	0.00	0.00	2.18	0.00
PM- 6	8.74	1.52	1.49	0.82	1.34	0.00	0.00	3.57	0.00
PM- 7	4.58	0.00	1.41	0.81	0.87	0.07	0.00	1.42	0.00
SUB-TOTAL	543.03	18.23	4.82	2.20	6.72	16.82	463.41	22.54	8.29
(SAN JUAN)									
SJ- 1	23.27	12.27	0.11	0.83	0.00	1.36	1.43	7.03	0.24
SJ- 2	10.53	5.71	0.00	0.03	1.42	1.38	0.00	1.78	0.21
SJ- 3	2.18	0.79	0.61	0.38	0.28	0.00	0.00	0.12	0.00
SJ- 4	9.96	1.37	4.60	0.29	0.28	0.06	0.00	3.18	0.18
SJ- 5	8.24	0.06	2.35	1.87	2.82	0.00	0.00	1.14	0.00
SJ- 6	14.02	0.49	5.68	3.38	0.26	0.26	0.00	3.95	0.00
SJ- 7	3.55	0.00	2.72	0.06	0.14	0.00	0.00	0.63	0.00
SJ- 8	12.07	1.85	5.26	1.05	0.00	0.00	0.00	3.91	0.00
SJ- 9	6.53	0.34	1.75	2.44	0.37	0.06	0.00	1.57	0.00
SJ- 10	1.09	0.00	0.33	0.34	0.20	0.00	0.00	0.22	0.00
SUB-TOTAL	91.44	22.88	23.41	10.67	5.77	3.12	1.43	23.53	0.63
(BAHO/BULI)									
BB- 1	16.55	7.63	2.68	0.63	0.26	1.45	2.21	1.48	0.21
BB- 2	6.63	0.42	0.02	0.00	0.26	1.42	2.19	2.05	0.27
BB- 3	5.55	0.41	0.17	0.18	0.97	1.29	0.00	2.53	0.00
BB- 4	26.52	3.31	0.34	0.00	0.24	1.21	5.68	15.51	0.23
BB- 5	4.21	1.23	0.00	0.19	1.14	0.15	0.69	0.81	0.00
BB- 6	4.46	1.33	0.00	0.00	0.72	1.12	0.00	1.29	0.00
BB- 7	10.49	1.75	0.00	0.17	0.58	0.61	1.62	5.76	0.00
SUB-TOTAL	74.41	16.08	3.21	1.17	4.17	7.25	12.39	29.43	0.71
(SOUTH PARANAQUE/LAS PINAS)									
PL- 1	11.49	6.96	0.15	0.00	1.71	1.45	0.00	1.07	0.15
PL- 2	3.44	1.22	0.00	0.00	0.00	1.24	0.00	0.98	0.00
PL- 3	19.25	11.42	0.11	0.00	1.35	1.23	1.16	3.98	0.00
PL- 4	6.27	4.41	0.00	0.00	0.32	0.21	0.57	0.63	0.13
PL- 5	9.72	5.35	0.14	0.00	0.64	2.24	0.25	0.53	0.57
ZP- 1	36.79	1.56	0.00	0.00	0.00	3.21	30.72	1.16	0.14
ZP- 2	3.67	3.44	0.00	0.00	0.00	0.23	0.00	0.00	0.00
ZP- 3	4.76	0.98	0.00	0.00	0.00	3.78	0.00	0.00	0.00
SUB-TOTAL	95.39	35.34	0.40	0.00	4.02	13.59	32.70	8.35	0.99

NOTE : The location of subbasins is presented in Fig. 3.1-1.

表3．1－1(2/2) １９８６年土地利用状況

UNIT : km2

SUB-BASIN	TOTAL AREA	RESIDENTIAL/COMMERCIAL			INDUST-RIAL	FISH POND	FOREST	OPEN SPACE	AGRICUL-TURE
		LOW D.	MID. D.	HIGH D.					
(MALABON NAVOTAS)									
MA- 1	2.26	0.38	0.00	0.00	0.34	1.54	0.00	0.00	0.00
MA- 2	2.05	0.13	0.79	0.00	0.00	1.13	0.00	0.00	0.00
MA- 3	2.21	0.00	1.23	0.62	0.03	0.04	0.00	0.21	0.08
MA- 4	0.50	0.04	0.22	0.00	0.00	0.03	0.00	0.21	0.00
MA- 5	1.89	0.00	1.09	0.00	0.67	0.00	0.00	0.06	0.07
MA- 6	1.34	0.00	0.00	0.71	0.00	0.61	0.00	0.02	0.00
MA- 7	2.40	0.00	0.50	0.75	0.35	0.50	0.00	0.30	0.00
MA- 8	3.76	0.00	0.32	1.25	0.00	0.19	0.00	2.00	0.00
MA- 9	0.30	0.00	0.18	0.00	0.07	0.00	0.00	0.05	0.00
MA- 10	0.91	0.00	0.35	0.11	0.21	0.00	0.00	0.24	0.00
MA- 11	0.69	0.00	0.21	0.00	0.42	0.00	0.00	0.06	0.00
MA- 12	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.32	0.00
SUB-TOTAL	18.63	0.55	4.89	3.44	2.09	4.04	0.00	3.47	0.15
(MANILA AND SUBURBS, NORTH)									
NM- 1	16.79	0.00	2.20	9.69	1.06	0.00	0.00	3.73	0.11
NM- 2	0.36	0.00	0.00	0.24	0.08	0.00	0.00	0.04	0.00
NM- 3	9.06	0.00	2.07	5.46	0.56	0.00	0.00	0.97	0.00
NM- 4	0.69	0.00	0.00	0.31	0.38	0.00	0.00	0.00	0.00
NM- 5	1.68	0.00	0.00	1.06	0.14	0.00	0.00	0.48	0.00
SUB-TOTAL	28.58	0.00	4.27	16.76	2.22	0.00	0.00	5.22	0.11
(MANILA AND SUBURBS, SOUTH)									
SM- 1	5.99	3.06	0.44	1.66	0.13	0.00	0.00	0.70	0.00
SM- 2	7.06	0.00	0.12	3.97	1.93	0.00	0.00	1.04	0.00
SM- 3	1.41	0.00	0.06	0.00	0.26	0.00	0.00	1.09	0.00
SM- 4	3.88	0.00	1.46	0.45	0.20	0.00	0.00	1.77	0.00
SM- 5	24.80	3.88	5.07	4.03	1.27	0.04	0.11	10.40	0.00
SUB-TOTAL	43.14	6.94	7.15	10.11	3.79	0.04	0.11	15.00	0.00
(EAST OF MANGAHAN)									
EM- 1	1.67	1.20	0.06	0.00	0.23	0.16	0.00	0.02	0.00
EM- 2	2.42	0.33	0.09	0.02	0.62	1.09	0.00	0.27	0.00
EM- 3	2.72	0.36	0.00	0.35	0.00	2.00	0.00	0.01	0.00
EM- 4	1.95	0.13	0.00	0.15	0.03	1.23	0.00	0.41	0.00
SUB-TOTAL	8.76	2.02	0.15	0.52	0.88	4.48	0.00	0.71	0.00
(WEST OF MANGAHAN)									
WM- 1	9.12	2.74	1.51	0.00	0.31	3.34	0.00	1.22	0.00
WM- 2	5.14	0.51	0.00	0.00	0.00	1.99	0.00	2.64	0.00
WM- 3	6.83	2.82	0.00	0.00	0.64	1.33	0.00	1.81	0.23
WM- 4	14.28	3.44	0.24	0.00	0.44	5.03	0.71	4.41	0.01
WM- 5	2.77	1.22	0.00	0.00	0.00	1.53	0.02	0.00	0.00
SUB-TOTAL	38.14	10.73	1.75	0.00	1.39	13.22	0.73	10.08	0.24
(PARANAQUE LAS PINAS)									
PA- 1	8.82	0.04	1.22	1.43	0.11	0.53	0.00	5.49	0.00
PA- 2	2.43	0.51	0.17	0.15	0.09	1.51	0.00	0.00	0.00
PA- 3	1.53	0.32	0.11	0.09	0.05	0.96	0.00	0.00	0.00
PA- 4	2.65	1.32	0.22	0.00	0.00	0.86	0.00	0.00	0.25
SUB-TOTAL	15.43	2.19	1.72	1.67	0.25	3.86	0.00	5.49	0.25

NOTE : The location of subbasins is presented in Fig. 3.1-1.

表3．1－2(1/2) ２０２０年土地利用状況

UNIT : km2

SUB-BASIN	TOTAL AREA	RESIDENTIAL/COMMERCIAL			INDUST-RIAL	FISH POND	FOREST	OPEN SPACE	AGRICUL-TURE
		LOW D.	MID. D.	HIGH D.					
(MEYCAUAYAN)									
ME- 1	23.67	1.11	0.92	0.00	0.00	0.13	21.29	0.09	0.13
ME- 2	15.06	0.46	5.34	0.00	0.06	2.63	4.93	1.58	0.06
ME- 3	21.81	6.63	13.18	0.54	0.88	0.04	0.26	0.28	0.00
ME- 4	29.23	3.01	1.04	0.00	1.02	16.32	6.69	0.84	0.31
ME- 5	9.32	1.63	1.15	0.00	1.79	3.75	0.73	0.19	0.08
ME- 6	24.52	4.73	4.66	0.48	1.56	8.93	2.76	1.18	0.22
ME- 7	8.82	1.93	2.00	0.00	2.78	1.06	0.00	1.05	0.00
ME- 8	17.81	0.00	8.71	1.00	7.69	0.37	0.00	0.04	0.00
ME- 9	18.42	4.73	5.40	0.87	0.13	7.26	0.00	0.03	0.00
SUB-TOTAL	168.66	24.23	42.40	2.89	15.91	40.49	36.66	5.28	0.80
(MALABON-TULLAHAN)									
MT- 1	25.82	0.00	0.26	0.00	0.00	0.00	25.56	0.00	0.00
MT- 2	13.38	9.92	3.46	0.00	0.00	0.00	0.00	0.00	0.00
MT- 3	20.08	0.63	9.78	3.88	4.85	0.73	0.00	0.21	0.00
MT- 4	9.97	0.00	1.72	5.23	2.14	0.82	0.00	0.06	0.00
SUB-TOTAL	69.25	10.55	15.22	9.11	6.99	1.55	25.56	0.27	0.00
(PASIG/MARIKINA)									
PM- 1	277.66	0.00	0.00	0.00	0.00	0.00	277.66	0.00	0.00
PM- 2	97.53	6.36	0.00	0.28	0.35	5.08	84.07	1.27	0.12
PM- 3	137.01	32.40	1.35	0.64	3.37	3.93	89.75	3.22	2.35
PM- 4	6.18	3.00	0.93	0.13	1.98	0.00	0.00	0.00	0.14
PM- 5	11.33	5.43	0.21	1.35	2.90	0.00	0.00	1.44	0.00
PM- 6	8.74	1.79	2.01	0.13	1.98	0.00	0.00	2.83	0.00
PM- 7	4.58	0.79	2.00	0.72	0.86	0.00	0.00	0.21	0.00
SUB-TOTAL	543.03	49.77	6.50	3.25	11.44	9.01	451.48	8.97	2.61
(SAN JUAN)									
SJ- 1	23.27	11.47	7.68	0.91	0.21	0.00	0.00	3.00	0.00
SJ- 2	10.53	0.00	5.22	3.07	2.07	0.00	0.00	0.17	0.00
SJ- 3	2.18	0.05	0.95	0.21	0.93	0.00	0.00	0.04	0.00
SJ- 4	9.96	1.80	3.46	0.94	0.57	0.00	0.00	3.19	0.00
SJ- 5	8.24	0.69	2.32	1.42	3.42	0.00	0.00	0.39	0.00
SJ- 6	14.02	0.42	6.50	3.82	0.24	0.00	0.00	3.04	0.00
SJ- 7	3.55	1.55	0.16	1.30	0.00	0.00	0.00	0.54	0.00
SJ- 8	12.07	2.71	4.29	1.82	0.00	0.00	0.00	3.25	0.00
SJ- 9	6.53	0.86	3.26	1.14	0.56	0.00	0.00	0.71	0.00
SJ- 10	1.09	0.00	0.62	0.14	0.29	0.00	0.00	0.04	0.00
SUB-TOTAL	91.44	19.55	34.46	14.77	8.29	0.00	0.00	14.37	0.00
(BAHO/BULI)									
BB- 1	16.55	11.11	2.92	0.51	1.16	0.00	0.00	0.85	0.00
BB- 2	6.63	6.21	0.00	0.00	0.00	0.14	0.00	0.28	0.00
BB- 3	5.55	1.42	0.27	0.63	1.54	0.16	0.00	1.53	0.00
BB- 4	26.52	22.59	0.48	0.00	0.00	0.74	0.76	1.95	0.00
BB- 5	4.21	0.72	2.32	0.36	0.42	0.00	0.00	0.39	0.00
BB- 6	4.46	4.22	0.00	0.00	0.24	0.00	0.00	0.00	0.00
BB- 7	10.49	6.00	0.38	0.00	2.47	0.00	1.31	0.33	0.00
SUB-TOTAL	74.41	52.27	6.37	1.50	5.83	1.04	2.07	5.33	0.00
(SOUTH PARANAQUE/LAS PINAS)									
PL- 1	11.49	8.28	0.00	0.00	1.38	0.25	0.00	1.58	0.00
PL- 2	3.44	2.92	0.00	0.00	0.00	0.52	0.00	0.00	0.00
PL- 3	19.25	16.07	0.00	1.22	1.28	0.00	0.00	0.68	0.00
PL- 4	6.27	5.12	0.09	0.00	1.03	0.00	0.03	0.00	0.00
PL- 5	9.72	9.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ZP- 1	36.79	2.86	0.00	0.00	0.00	3.21	30.02	0.56	0.14
ZP- 2	3.67	3.48	0.00	0.00	0.00	0.19	0.00	0.00	0.00
ZP- 3	4.76	0.98	0.00	0.00	0.00	3.78	0.00	0.00	0.00
SUB-TOTAL	95.39	49.43	0.09	1.22	3.69	7.95	30.05	2.82	0.14

NOTE : The location of subbasins is presented in Fig. 3.1-1.

表３．１－２(2/2) ２０２０年土地利用状況

UNIT : km2

SUB-BASIN	TOTAL AREA	RESIDENTIAL/COMMERCIAL			INDUST-RIAL	FISH POND	FOREST	OPEN SPACE	AGRICUL-TURE
		LOW D.	MID. D.	HIGH D.					
(MALABON NAVOTAS)									
MA- 1	2.26	1.30	0.00	0.00	0.68	0.28	0.00	0.00	0.00
MA- 2	2.05	0.61	0.49	0.22	0.00	0.50	0.00	0.23	0.00
MA- 3	2.21	0.57	0.00	1.60	0.00	0.01	0.00	0.03	0.00
MA- 4	0.50	0.28	0.07	0.00	0.06	0.00	0.00	0.09	0.00
MA- 5	1.89	0.00	1.41	0.24	0.17	0.00	0.00	0.07	0.00
MA- 6	1.34	0.00	1.16	0.18	0.00	0.00	0.00	0.00	0.00
MA- 7	2.40	0.00	1.51	0.80	0.02	0.00	0.00	0.07	0.00
MA- 8	3.76	0.00	3.65	0.09	0.00	0.00	0.00	0.02	0.00
MA- 9	0.30	0.00	0.00	0.07	0.23	0.00	0.00	0.00	0.00
MA- 10	0.91	0.00	0.24	0.25	0.42	0.00	0.00	0.00	0.00
MA- 11	0.69	0.00	0.09	0.00	0.60	0.00	0.00	0.00	0.00
MA- 12	0.32	0.00	0.00	0.00	0.32	0.00	0.00	0.00	0.00
SUB-TOTAL	18.63	2.76	8.62	3.45	2.50	0.79	0.00	0.51	0.00
(MANILA AND SUBURBS, NORTH)									
NM- 1	16.79	0.30	0.34	11.97	0.89	0.00	0.00	3.29	0.00
NM- 2	0.36	0.00	0.00	0.09	0.25	0.00	0.00	0.02	0.00
NM- 3	9.06	0.00	0.00	7.24	1.06	0.00	0.00	0.76	0.00
NM- 4	0.69	0.00	0.00	0.35	0.34	0.00	0.00	0.00	0.00
NM- 5	1.68	0.00	0.00	0.21	1.44	0.00	0.00	0.03	0.00
SUB-TOTAL	28.58	0.30	0.34	19.86	3.98	0.00	0.00	4.10	0.00
(MANILA AND SUBURBS, SOUTH)									
SM- 1	5.99	2.96	0.52	1.80	0.16	0.00	0.00	0.55	0.00
SM- 2	7.06	0.00	0.25	4.41	1.67	0.00	0.00	0.73	0.00
SM- 3	1.41	0.00	0.00	0.00	0.49	0.00	0.00	0.92	0.00
SM- 4	3.88	0.00	0.00	2.24	0.34	0.00	0.00	1.30	0.00
SM- 5	24.80	2.93	6.10	4.73	1.51	0.00	0.00	9.53	0.00
SUB-TOTAL	43.14	5.89	6.87	13.18	4.17	0.00	0.00	13.03	0.00
(EAST OF MANGAHAN)									
EM- 1	1.67	1.50	0.17	0.00	0.00	0.00	0.00	0.00	0.00
EM- 2	2.42	0.04	0.70	0.13	0.65	0.44	0.00	0.46	0.00
EM- 3	2.72	0.79	0.00	0.00	0.15	1.78	0.00	0.00	0.00
EM- 4	1.95	0.84	0.00	0.03	0.00	1.05	0.00	0.03	0.00
SUB-TOTAL	8.76	3.17	0.87	0.16	0.80	3.27	0.00	0.49	0.00
(WEST OF MANGAHAN)									
WM- 1	9.12	2.35	0.52	2.86	1.88	0.43	0.00	1.08	0.00
WM- 2	5.14	3.13	0.00	0.00	0.82	0.56	0.00	0.63	0.00
WM- 3	6.83	3.70	0.84	0.59	1.62	0.00	0.00	0.04	0.04
WM- 4	14.28	7.14	0.52	2.05	0.34	0.00	0.00	4.23	0.00
WM- 5	2.77	2.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUB-TOTAL	38.14	19.09	1.88	5.50	4.66	0.99	0.00	5.98	0.04
(PARANAQUE LAS PINAS)									
PA- 1	8.82	0.00	1.88	1.25	0.00	0.51	0.00	5.18	0.00
PA- 2	2.41	1.14	0.00	0.69	0.00	0.58	0.00	0.00	0.00
PA- 3	1.55	0.73	0.00	0.45	0.00	0.37	0.00	0.00	0.00
PA- 4	2.65	1.79	0.09	0.56	0.00	0.21	0.00	0.00	0.00
SUB-TOTAL	15.43	3.66	1.97	2.95	0.00	1.67	0.00	5.18	0.00

NOTE : The location of subbasins is presented in Fig. 3.1-1.

表３．３—１　地下水位と地盤沈下

PERIOD	OBSERVATION YEAR	ALLUVIAL DEPOSIT		GUADALUPE FORMATION	
		GROUND LEVEL	G.W. LEVEL	GROUND LEVEL	G.W. LEVEL
- 1950					
	1955		----------		----------
- 1960			DOWN		DOWN
	1967	DOWN	----------		----------
- 1970					
	1979	----------	UP	----------	DOWN
- 1980	1981	ALMOST UNCHANGED	----------	UNCHANGED	----------
	1988	----------	UNCHANGED	----------	UNCHANGED
- 1990			OR UP		OR UP

表３．４－１　河川流域の確率流域平均２日雨量

RIVER BASIN	PROBABLE TWO-DAY RAINFALL (mm) IN FLOOD RETURN PEIROD						
	100-YR	50-YR	30-YR	20-YR	10-YR	5-YR	2-YR
Malabon-Tullahan	700	620	570	520	430	360	240
Marikina (St.Nino)	660	600	540	510	440	370	270
San Juan	660	600	550	510	430	360	250
Pasig-Marikina *	*660*	*600*	*540*	*510*	440	370	270
Buli-Baho-Mahaba	670	580	500	470	400	320	210
South Paranaque-Las Pinas	770	660	570	520	420	320	200

NOTE *: Including the San Juan River Basin.

表３．４－２　サントニーニョ地点の年最大流量

YEAR	DATE	H.MAX (m)	Q.MAX (m3/s)
1958	Sep. 10	14.78	507
1959	Nov. 19	-	2,072
1960	Aug. 14	18.06	1,562
1961	Sep. 22	16.82	1,161
1962	Jul. 20	17.10	1,261
1963	Jun. 28	16.19	931
1964	Jun. 30	17.45	1,367
1965	Jun. 24	15.48	702
1966	Nov. 21	19.40	2,036
1967	Jun. 08	18.20	1,609
1968	Aug. 29	16.68	1,107
1969	Sep. 01	17.45	1,350
1970	Sep. 02	20.48	2,464
1971	-	14.50	439
1972	Aug. 01	18.05	1,559
1973	Oct. 08	13.95	318
1974	Jul. 20	13.98	324
1975	Aug. 10	13.70	269
1976	May 22	16.90	1,192
1977	Nov. 14	19.44	2,051
1986	Sep. 01	20.92	2,650

NOTE: No records between 1978 and 1985.
The annual maximum discharge was calculated from the rating curve newly established by the study team.

表３．４－３　各土地利用の流出係数とＣの値

No.	Land Use		Runoff Coefficient	C-Value
	Code	Classification	f	c
1	Urban Area 1	Low Density Residential	0.50	90
2	Urban Area 2	Middle Density Residential	0.65	80
3	Urban Area 3	High Density Residential	0.80	70
4	Factory 1	Factories in Manila City and Pasig Riverine	0.65	80
5	Factory 2	Factories in Suburbs	0.50	120
6	Open Space	Park, Golf Course, Military Space, Airport, Graveyard and Race Course	0.35	170
7	Farmland 1	Paddy Field and Fishpond	0.10	1100
8	Farmland 2	Other Form of Farming Area	0.30	210
9	Mountainous Area	Tropical Forest, Grassland, Bush and Orchard in Steep Slope	0.80	290

表３．４－４(1/2) ２０２０年土地利用下の小排水域の確率流量

NAME	CATCHMENT AREA (ha)	RUNOFF COEFFICIENT	PROBABLE DISCHARGE (m3/s) IN FLOOD RETURN PEIROD						
			100-YR	50-YR	30-YR	10-YR	5-YR	3-YR	2-YR
MANILA & SUBURBS									
(North)									
NM-1	1,679	0.70	324.7	299.9	285.9	249.1	223.1	200.3	179.7
NM-2	36	0.67	16.6	15.1	14.3	12.3	11.1	9.9	9.1
NM-3	906	0.74	221.6	204.0	194.2	168.9	151.5	135.9	122.4
NM-4	69	0.73	27.1	24.7	23.4	20.3	18.3	16.3	14.9
NM-5	168	0.66	52.8	48.2	45.8	39.6	35.7	31.9	29.1
(South)									
SM-1	599	0.59	114.8	105.7	100.6	87.5	78.5	70.4	63.4
SM-2	706	0.71	170.6	156.9	149.3	129.8	116.4	104.4	94.2
SM-3	141	0.45	34.3	31.2	29.6	25.6	23.1	20.6	18.8
SM-4	388	0.64	111.6	102.0	96.9	83.9	75.5	67.6	61.4
SM-5	2,480	0.55	323.7	300.0	286.2	249.8	223.4	200.8	179.5
MALABON-NAVOTAS									
MT-4-1	411	0.65	92.2	84.7	80.6	70.1	62.9	56.4	50.9
MT-4-2	218	0.65	50.3	46.2	44.0	38.2	34.3	30.7	27.7
MA-1	226	0.45	37.0	34.0	32.3	28.1	25.2	22.6	20.4
MA-2	205	0.45	30.6	28.2	26.8	23.3	20.9	18.8	16.9
MA-3	221	0.71	64.6	59.1	56.2	48.7	43.8	39.2	35.6
MA-4	50	0.49	13.8	12.6	11.9	10.3	9.3	8.3	7.6
MA-5	189	0.64	45.9	42.1	40.0	34.8	31.2	28.0	25.3
MA-6	134	0.67	36.6	33.5	31.9	27.6	24.8	22.3	20.2
MA-7	240	0.69	52.7	48.6	46.3	40.2	36.1	32.4	29.1
MA-8	376	0.65	88.6	81.3	77.4	67.2	60.3	54.1	48.9
MA-9	30	0.57	12.0	10.8	10.3	8.8	8.0	7.1	6.6
MA-10	91	0.62	25.6	23.4	22.2	19.2	17.3	15.5	14.1
MA-11	69	0.52	17.6	16.0	15.2	13.2	11.9	10.6	9.7
MA-12	32	0.50	11.2	10.1	9.6	8.3	7.5	6.7	6.1
EAST OF MANGAHAN									
EM-1	167	0.52	36.5	33.4	31.7	27.5	24.7	22.2	20.1
EM-2	242	0.46	36.9	33.9	32.3	28.1	25.2	22.6	20.4
EM-3	272	0.24	21.7	19.9	19.0	16.5	14.8	13.3	12.0
EM-4	195	0.29	23.8	21.8	20.7	17.9	16.1	14.4	13.1
WEST OF MANGAHAN									
WM-1	912	0.57	111.7	103.7	99.0	86.6	77.4	69.6	62.0
WM-2	514	0.44	63.8	58.9	56.2	48.9	43.8	39.4	35.3
WM-3	683	0.54	83.5	77.4	73.9	64.6	57.7	51.9	46.3
WM-4	1,428	0.50	131.9	122.1	115.9	101.1	90.1	81.2	71.9
WM-5	277	0.50	52.5	48.1	45.8	39.7	35.7	32.0	28.9

NOTE: Fig.3.4-3 shows the location of subdrainage areas.

表３．４－４(2/2) ２０２０年土地利用下の小排水域の確率流量

NAME	CATCHMENT AREA (ha)	RUNOFF COEFFICIENT	PROBABLE DISCHARGE (m3/s) IN FLOOD RETURN PEIROD						
			100-YR	50-YR	30-YR	10-YR	5-YR	3-YR	2-YR
SAN JUAN									
SJ-5-1	283	0.59	57.2	52.6	50.1	43.5	39.1	35.0	31.6
SJ-5-2	31	0.59	9.0	8.2	7.8	6.7	6.0	5.4	4.9
SJ-7-1	256	0.59	70.9	64.7	61.5	53.2	47.9	42.9	39.0
SJ-7-2	92	0.59	28.3	25.7	24.4	21.1	19.0	17.0	15.5
SJ-8-1	87	0.56	22.1	20.2	19.2	16.6	14.9	13.4	12.2
SJ-8-2	59	0.56	14.5	13.2	12.6	10.9	9.8	8.8	8.0
SJ-9-1	94	0.61	23.6	21.6	20.5	17.8	16.0	14.3	13.0
SJ-9-2	187	0.61	40.5	37.2	35.4	30.7	27.6	24.8	22.3
SJ-9-3	62	0.61	18.1	16.5	15.7	13.6	12.2	11.0	10.0
SJ-10	109	0.62	27.8	25.5	24.2	21.0	18.9	16.9	15.3
MANDALUYONG-PASIG									
PM-5-1	929	0.52	91.8	83.7	79.4	68.7	61.8	55.3	50.5
PM-5-2	138	0.52	36.9	33.7	31.9	27.6	24.9	22.3	20.3
PM-7	458	0.61	109.8	100.7	95.7	83.1	74.6	66.9	60.6
MARIKINA									
PM-3-1	32	0.51	11.4	10.3	9.8	8.4	7.6	6.8	6.3
PM-3-2	42	0.51	11.5	10.4	9.9	8.6	7.7	6.9	6.3
PM-3-3	149	0.51	36.3	33.1	31.4	27.2	24.5	21.9	19.9
PM-3-4	193	0.51	37.3	34.3	32.6	28.3	25.4	22.8	20.6
PM-3-5	76	0.51	17.6	16.0	15.2	13.2	11.9	10.6	9.7
PM-3-6	125	0.51	28.9	26.4	25.1	21.7	19.5	17.5	15.9
PM-4-1	344	0.52	76.6	70.1	66.6	57.7	51.9	46.5	42.2
PM-4-2	207	0.52	43.7	40.0	38.0	33.0	29.6	26.6	24.1
PARANAQUE-LAS PINAS									
PA-1	882	0.46	125.0	115.2	109.8	95.5	85.6	76.8	69.1
PA-2	243	0.49	30.1	27.9	26.6	23.2	20.7	18.6	16.7
PA-3	153	0.49	44.0	39.9	37.9	32.7	29.5	26.4	24.1
PA-4	265	0.54	56.5	51.8	49.3	42.7	38.4	34.4	31.2
VALENZUELA									
ME-9	1,842	0.40	163.5	151.8	144.9	126.6	113.1	101.8	90.7

NOTE: Fig.3.4-3 shows the location of subdrainage areas.

表３．４－５　１９８６年土地利用下の優先排水域の確率流量

NAME	CATCHMENT AREA (ha)	RUNOFF COEFFICIENT	PROBABLE DISCHARGE (m3/s) IN FLOOD RETURN PEIROD						
			100-YR	50-YR	30-YR	10-YR	5-YR	3-YR	2-YR
MALABON-NAVOTAS									
MT-4-1	411	0.51	72.34	66.46	63.24	55.00	49.35	44.25	39.94
MT-4-2	218	0.51	39.47	36.25	34.52	29.97	26.91	24.09	21.73
MA-1	226	0.23	18.9	17.4	16.5	14.4	12.9	11.6	10.4
MA-2	205	0.34	23.1	21.3	20.3	17.6	15.8	14.2	12.8
MA-3	221	0.64	58.2	53.3	50.7	43.9	39.5	35.4	32.1
MA-4	50	0.48	13.6	12.3	11.7	10.1	9.1	8.1	7.4
MA-5	189	0.57	40.9	37.5	35.7	31.0	27.8	24.9	22.5
MA-6	134	0.47	25.7	23.5	22.4	19.4	17.4	15.6	14.2
MA-7	240	0.52	39.7	36.6	34.9	30.3	27.2	24.4	22.0
MA-8	376	0.51	69.5	63.8	60.7	52.7	47.3	42.4	38.4
MA-9	30	0.57	12.0	10.8	10.3	8.8	8.0	7.1	6.6
MA-10	91	0.55	22.7	20.7	19.7	17.0	15.3	13.7	12.5
MA-11	69	0.52	17.6	16.0	15.2	13.2	11.9	10.6	9.7
MA-12	32	0.35	7.8	7.1	6.7	5.8	5.2	4.7	4.3
EAST OF MANGAHAN									
EM-1	167	0.47	33.0	30.2	28.7	24.9	22.4	20.0	18.2
EM-2	242	0.31	24.9	22.9	21.8	18.9	17.0	15.2	13.7
EM-3	272	0.24	21.7	19.9	19.0	16.5	14.8	13.3	12.0
EM-4	195	0.24	19.7	18.0	17.1	14.8	13.3	12.0	10.8
WEST OF MANGAHAN									
WM-1	912	0.36	70.5	65.5	62.6	54.7	48.9	44.0	39.1
WM-2	514	0.27	39.2	36.2	34.5	30.0	26.9	24.2	21.7
WM-3	683	0.38	58.7	54.5	52.0	45.4	40.6	36.5	32.6
WM-4	1,428	0.33	87.0	80.6	76.5	66.1	58.3	52.1	45.9
WM-5	277	0.28	29.4	26.9	25.6	22.2	20.0	17.9	16.2

NOTE: Fig.3.4-3 shows the location of subdrainage areas.

表３．４－６　　年最大湖水位

ORDER	OCCURRENCE		LAKE WATER STAGE
	YEAR	MONTH	(EL.m)
1.	1972	August	14.03
2.	1978	October	13.58
3.	1986	October	13.34
4.	1960	October	13.17
5.	1952	October	13.08
6.	1967	November	12.87
7.	1976	May	12.77
8.	1962	September	12.77
9.	1956	September	12.76
10.	1984	October	12.67
11.	1948	September	12.54
12.	1970	December	12.53
13.	1980	November	12.43
14.	1974	November	12.40
15.	1946	October	12.36
16.	1947	December	12.36
17.	1961	November	12.29
18.	1953	December	12.28
19.	1963	September	12.24
20.	1985	October	12.20
21.	1966	December	12.16
22.	1951	December	12.15
23.	1973	December	12.08
24.	1982	September	12.08
25.	1971	September	12.05
26.	1977	September	12.03
27.	1950	October	11.98
28.	1979	August	11.95
29.	1983	October	11.94
30.	1958	October	11.92
31.	1981	November	11.90
32.	1957	October	11.87
33.	1965	September	11.76
34.	1949	November	11.72
35.	1955	December	11.71
36.	1975	January	11.69
37.	1968	October	11.67
38.	1954	November	11.54
39.	1987	December	11.51
40.	1959	November	11.49
41.	1969	September	11.27

表３．５－１(1/2) 排水区と排水方法

Drainage District	Area (ha)	Drainage Method	Pump Capacity (m^3/s)	Major Drainage Channel	
				Estero/Drain	Drainage Main/Outfall
MANILA AND SUBURBS					
(NORTH)					
1. Sunog Apog	802	Gravity drainage through Estero de Sunog Apog and Estero de Vitas to Manila Bay.	-	Sunog Apog (2.97/25.0)	Blumentritt (2.97/2.57)* Kanlaon-Ply Margal (0.65/2.00)
2. Vitas	573	Gravity drainage through Estero de Vitas and Estero dela Reina to Manila Bay. A pumping station will be constructed.	-	Vitas (1.84/52.6) Reina (1.31/15.8)	Solis-Tecson (1.48/2.20)* South Antipolo (1.42/4.40) Tayuman (1.61/2.40)
3. Balut	36	Gravity flow to Manila Bay. A pumping station will be constructed.	-	-	-
4. Northeast Pasig	72	Gravity drainage to Pasig River.	-	-	-
5. Valencia P.S.	277	Pump drainage to Pasig River.	10.5	Valencia (0.85/11.2)	Visayas (0.67/2.05)*
6. Aviles-Sampaloc P.S.	345	-do-	14.1	Sampaloc (0.65/15.6) San Miguel (1.18/9.0)	Washington-Ply Margal (0.36/2.40) Economia (0.59/2.20)* Lepanto-Josefina (1.16/4.22) Lepanto-Gov. Forbes (1.06/3.60)**
7. Quiapo P.S.	212	-do-	9.5	Quiapo (0.96/25.6) San Miguel (1.32/18.7)	Severino Reyes (0.54/3.20)
8. Binondo P.S.	304	-do-	11.4	Reina (1.55/23.1) Binondo (0.90/22.3)	Zurbaran (0.71/2.15)*
9. Northwest Pasig	69	Gravity drainage to Pasig River.	-	-	-
10. North Manila Bay	168	Gravity drainage to Manila Bay.	-	-	Pacheco (1.11/4.28) Lakandula (0.88/3.84)
Sub-Total	2,858		45.5		
(SOUTH)					
1. Makati Slope	307	Gravity drainage to Pasig River.	-	-	Zorbel Orbit (1.17/5.00)
2. Makati P.S.	142	Pump drainage to Pasig River.	7.0	-	Makati Headrace No. 1 (0.41/2.60) Makati Headrace No. 2 (0.63/5.00)
3. Sta. Clara P.S.	150	-do-	5.3	Sta. Clara (1.34/6.2)	-
4. San Andres	339	Pump drainage to Pasig River. A pumping station will be constructed.	-	Pandacan (2.43/11.3) Tripa de Gallina (2.00/12.7)	Vito Cruz (1.32/2.05) Estrada (0.59/2.94)

Note: Figures in parenthesis indicate Length (km)/Width (m).
* indicates drainage main/outfall with 2 bays
** indicates drainage main/outfall with 3 bays

表3．5－1(2/2) 排水区と排水方法

Drainage District	Area (ha)	Drainage Method	Pump Capacity (m^3/s)	Major Drainage Channel	
				Estero/Drain	Drainage Main/Outfall
5. Pandacan P.S.	104	Pump drainage to Pasig River.	4.4	Pandacan (1.78/18.1)	-
6. Paco P.S.	178	-do-	7.6	Paco (1.60/20.4)	-
7. Baleto	85	Gravity drainage to Manila Bay.	-	-	-
8. Southwest Pasig	141	Gravity drainage to Pasig River.	-	-	-
9. South Manila Bay	388	Gravity drainage to Manila Bay.	-	-	Padre Faura (1.16/3.20) Remedios (1.34/4.40)
10. Libertad P.S.	755	Pump drainage to Manila Bay.	48.0	Tripa de Gallina (2.40/12.3)	Buendia Roxas (1.96/4.60)** Libertad (1.80/4.70) EDSA (1.73/4.30)*
11. Tripa de Gallina P.S.	1,725	-do-	56.0	Tripa de Gallina (2.39/26.6)	-
Sub-Total	4,314		128.3		
Total	7,172		173.8		
MALABON-NAVOTAS (DAGAT-DAGATAN)					
1. Spine	164	Gravity drainage through Spine Drain to Bangkulasi River.	-	Spine (2.0/5.0)	-
2. Saluysoy	97	Gravity drainage through Saluysoy Drain to Bangkulasi River.	-	Saluysoy (1.7/4.5)	-
3. Maypajo	115	Gravity drainage through Northern and Southern drains to Estero North Sunog Apog.	-	Northern (1.1/4.0) Southern (0.8/3.0)	-
4. Kapitbahayan	91	Gravity drainage through laterals to Bangkulasi River and Manila Bay.	-	-	-

Note: Figures in parentheses indicate Length (km)/Width (m).
* indicates drainage main/outfall with 2 bays
** indicates drainage main/outfall with 3 bays

表３．６－１　マニラと近郊部のポンプ能力、疎通能力、５年、１０年確率流量の比較

Drainage District	Existing Pump Capacity (m^3/s)	Pump Capacity for 10-Year Return Period Flood (m^3/s)	Pump Capacity for 5-Year Return Period Flood (m^3/s)	Drainage Channel	Flow Capacity (m^3/s)	10-Year Return Period Flood (m^3/s)	5-Year Return Period Flood (m^3/s)
North Manila and Suburbs							
Sunog Apog	-	-	-	Estero de Vitas	*	161	144
				Estero de Sunog Apog	56	108	97
				Estero de Maypajo	35	91	73
				Blumentritt Interceptor	20	37	32
Vitas	(31.8)	31.8	25.2	Estero de Vitas	50	67	60
				Estero dela Reina	20	29	26
Balut	(2.0)	2.0	1.4				
Northeast Pasig	-	5.5	4.4				
Valencia P.S.	10.5	18.0	14.4	Estero de Valencia	30	59	53
				Visayas Main	18	19	17
Aviles-Sampaloc P.S.	14.1	18.3	14.6	Estero de Sampaloc	40	48	43
				Lepanto-Gov. Forbes Main	50	48	43
				Economia Main	10	21	19
				Lepanto-Josefina Main	20	35	32
				Estero de San Miguel	5	19	17
Quiapo P.S.	9.5	11.2	9.0	Estero de Quiapo	40	37	33
				Estero de San Miguel	20	18	16
				Severino Reyes Main	7	15	13
Binondo P.S.	11.4	17.2	13.7	Estero de Binondo	40	50	45
				Estero dela Reina	5	49	44
Northwest Pasig	-	-	-	-	-	-	-
North Manila Bay	-	-	-	Pacheco Main	8	13	12
				Lakandula Main	10	9	8
South Manila and Suburbs							
Makati Slope	-	-	-	Zobel Orbit Outfall	40	40	36
Makati P.S.	7.0	7.0	5.6	Pond	-	25	22
				Makati Headrace No. 1	13	13	10
				Makati Headrace No. 2	17	16	13
Sta. Clara P.S.	5.3	9.6	8.0	Estero de Sta. Clara	5	32	29
San Andres	(17.4)	17.4	13.6	Estero de Pandacan	3	58	51
				Estero Tripa de Gallina	5	26	23
Pandacan P.S.	4.4	7.1	5.7	Estero de Pandacan	15	26	24
Paco P.S.	7.6	9.7	7.9	Estero de Paco	50	36	32
				Estero de Paco/1	20	28	25
Balete	-	5.3	4.4				
Southwest Pasig	-	-	-	-	-	-	-
South Manila Bay	-	-	-	Padre Faura Main	20	19	17
				Remedios Main	17	17	16
Libertad P.S.	48.0	54.2	43.8	Pond	-	122	110
				Buendia-Roxas Outfall	50	50	45
				Libertad Outfall	8	8	7
				EDSA	25	25	23
				Estero Tripa de Gallina/2	10	45	41
				Zobel-Roxas Main	18	19	17
Tripa de Gallina P.S.	56.0	58.8	46.6	Tripa de Gallina/3	100	132	117
				-do- /4	60	49	43
				-do- /5	20	65	59

Note: Figures in parentheses indicate the planned pump capacity in the project assisted by the Government of Japan.

* Bank of channel is lower than the Design Tide Level (EL 11.60 m).
/1 Upper reaches of Estero dela Concordia
/2 The reaches between Zobel-Roxas Main and Buendia-Roxas Outfall
/3 The reaches between the pumping station and Dilain Creek
/4 The reaches between Dilain Creek and EDSA
/5 Upper reach from EDSA

表3．7—1　水質基準値

Quality Parameter	Fresh Surface Water					
Class	AA	A	B	C	D	E
Color, Units		75	50	50		
Temperature °C		30	30	3(e)	3(e)	
Transparency			(c)	(c)	(c)	
Dissolved Oxygen		5	5	5	3	2
5-day BOD at 20°C		10	15	20		
Total Dissolved Solids				1,000	1,000	
Total Solids	(a)	(a)		2,000	2,000	
pH	(a)	6.5-8.5	6.5-8.5	6.5-8.5	6.0-8.5	5.0-9.0
Coliform, MPN/100 mℓ	50	5,000	1,000	5,000		
Phenolic substances	(a)	(a)	0.002	0.02		

Remarks: 1. (a) National standars for Drinking Water in the Philippines.
(b) Shall not be present in concentration to cause deleterious or abnormal biotic growth.
(c) Secchi Disk shall be visible at a minimum depth of one (1) meter.
(d) Recommended maximum concentration for irrigating citrus is 0.075 mg/ℓ.
(e) Rise in temperature.

2. All values are maximum permissible except for Dissolved Oxygen which is minimum permissible.

3. All units in mg/ℓ except those indicated.

4. Water usage and classification of fresh surface water:

Classifications	Best usage
- Class AA	For source of public water supply. This class is intended primarily for water having watersheds which are uninhabited and otherwise protected and which require only approved disinfection in order to meet the National Standards for Drinking Water (NSDW) of the Philippines.
- Class A	For source of water supply that will require complete treatment (coagulation, sedimentation, filtration and disinfection) in order to meet the NSDW.
- Class B	For primary contact recreation.
- Class C	For the propagation and growth of fish and other aquatic resources.
- Class D	For agriculture, irrigation, livestock watering and industrial cooling and processing.
- Class E	For navigational use.

Source : Rules & Regulations of the National Pollution Control Commission (1978), Section 69, Table 1 - NPCC Water Quality Criteria (1978)

表３．９－１　NCR の洪水防御・排水事業関係支出の予測

Unit: million peso

GROWTH RATE/ ITEM	1988	1990	1995	2000	2005	2010	2015	2020
- 5% Growth Rate								
Development Expenditure	33,970	37,450	47,800	61,010	77,870	99,380	126,840	161,880
DPWH	5,270	5,800	7,410	9,460	12,070	15,400	19,660	25,090
DPWH, NCR	840	930	1,190	1,510	1,930	2,460	3,150	4,010
Flood Control	210	230	300	380	480	620	790	1,000
- 4% Growth Rate								
Development Expenditure	35,270	38,150	46,420	56,480	68,710	83,600	101,710	123,740
DPWH	5,470	5,910	7,200	8,750	10,650	12,960	15,770	19,180
DPWH, NCR	880	950	1,150	1,400	1,700	2,070	2,520	3,070
Flood Control	220	240	290	350	430	520	630	770
- 3% Growth Rate								
Development Expenditure	34,940	37,060	42,970	49,810	57,740	66,940	77,600	89,960
DPWH	5,420	5,740	6,660	7,720	8,950	10,380	12,030	13,940
DPWH, NCR	870	920	1,070	1,240	1,430	1,660	1,920	2,230
Flood Control	220	230	270	310	360	420	480	560

NOTE

DPWH : The rate of allocating development expenditure to DPWH (15.5%)
DPWH, NCR : Regional allocation of DPWH's budget to NCR (16%)
Flood Control: Sectoral allocation of DPWH's bedget in NCR to flood control and drainage works (25%)

表4．1－1　フレームワークプラン、マスタープラン、優先プロジェクトの計画基準

Planning Criteria	Framework Plan	Master Plan	Priority Project
Target Completion Year	Not specified, but far future.	Year 2020	Year 2000
Coverage Area	Metro Manila Area, Cainta and Taytay.	In principle, same as Framework Plan.	Areas with top priority.
Land Use Condition	As of 2020.	As of 2020.	As of the present.
Design Return Period	River: 100-yr. Drainage: 10-yr.	To be set up river by river based on financial condition.	To be set up for the selected areas in consideration of economic viability
Financial Aspects	No consideration on financial aspect.	Within the limitation of funds available until the target completion year.	Within the limitation financial sources obtainable until the target completion year.

表５．３－１(1/4) フレームワークプランの建設費

PASIG-MARIKINA RIVER IMPROVEMENT (100-Yr)

River	Stretch	Length (M)	Design Discharge (m3/s)	Required Works							Construction Cost		
				Exca. (1000m3)	Embank. (1000m3)	Revet. (1000m2)	Concrete (1000m3)	Gate (ton)	Re.Bridge (place)	Land Acq. (1000m2)	Civil Works (mil.Peso)	L.A./Compen. (mil.Peso)	Total (mil.Peso)
River Mouth/San Juan C.	Sta. 0+000/ 8+735	8,735	1150	2,334	0	40	3	0	1	20	646	60	706
San Juan C./Napindan C.	Sta. 8+735/18+495	9,760	500	300	0	60	10	0	0	15	212	45	257
Napindan C./M.C.G.S.	Sta.18+495/ 5+425	5,580	500	100	10	10	1	0	0	8	39	24	63
M.C.G.S. /Mangahan C.	Sta. 5+425/ 6+635	1,210	500	100	0	2	1	0	0	15	24	18	42
Mangahan C./Sta.7+425	Sta. 6+635/ 7+425	790	2900	50	5	2	2	0	0	10	26	12	38
M.C.G.S.			500	30	6	0	22	300	0	1	183	1	184
San Juan River	Sta. 0+000/10+653	10,653	900	1,820	0	175	43	0	4	50	580	177	757
	Sub-Total	36,728		4,734	21	289	82	300	5	119	1,710	337	2,047
Sta.7+425 /Nangka C.	Sta. 7+425/18+620	11,195	2900	2,493	555	109	46	0	0	950	497	334	831
Nangka C. /Rodorigez B.	Sta.18+620/27+200	8,580	2600	1,596	692	0	0	0	0	1,753	218	517	735
Marikina Dam (Qcut=600m3/s)			2100	40	0	0	120	0	0	2,500	675	125	800
	Sub-Total	19,775		4,129	1,246	109	166	0	0	5,203	1,390	976	2,366
	Total	56,503		8,863	1,267	398	248	300	5	5,322	3,100	1,313	4,413
Paranaque Spillway(C. Bottom Width : 60m)		9,000		7,600	45	30	50	590	5	580	3,476	524	4,000
	G.Total	56,503		16,463	1,312	428	298	890	10	5,902	6,576	1,837	8,413

表5．3－1(2/4) フレームワークプランの建設費

BAHO BULI MAHABA RIVER IMPROVEMENT (100-Yr)

River	Stretch	Length (M)	Design Discharge (m3/s)	Required Works							Construction Cost		
				Exca. (1000m3)	Embank. (1000m3)	Revet. (1000m2)	Concrete (1000m3)	Gate (ton)	Re.Bridge (place)	Land Acq. (1000m2)	Civil Works (mil.Peso)	L.A./Compen. (mil.Peso)	Total (mil.Peso)
Mahaba River	Sta. 0+000/ 5+000	5,000	190	475	43	0	0	0	6	210	78	159	237
	Sta. 5+000/ 6+000	1,000	190	12	0	0	0	0	0	3	1	3	4
	Sub-Total	6,000		487	43	0	0	0	6	213	79	162	241
Baho River	Sta. 0+000/ 5+500	5,500	335	682	37	0	0	0	7	209	112	146	258
	Sta.A0+000/A2+000	2,000	280	231	4	0	0	0	3	63	35	19	54
	Sta.A2+000/A3+000	1,000	280	49	0	0	0	0	0	10	5	3	8
	Sub-Total	8,500		962	41	0	0	0	10	282	152	168	320
Buli River	Sta. 0+000/6A+200	3,100	330	292	44	0	0	0	4	98	82	86	168
	Sta.6A+200/8A+200	2,000	280	304	6	0	0	0	3	73	45	22	67
	Sta.8A+200/9A+830	1,630	280	207	16	0	0	0	1	74	40	22	62
	Sta.9A+830/10+480	650	280	85	7	0	0	0	1	32	14	38	52
	Sta.10+480/14+000	2,520	200	317	20	0	0	0	3	113	57	135	192
	Sta.14+000/15+000	1,000	200	73	0	0	0	0	1	19	21	23	44
	Sub-Total	10,900		1,278	93	0	0	0	13	409	259	326	585
Tributary-B	Sta. 0+000/ 5+000	5,000	110	414	13	0	0	0	3	144	70	43	113
	Sta. 5+000/ 6+000	1,000	110	24	2	0	0	0	2	14	7	4	11
	Sub-Total	6,000		438	15	0	0	0	5	158	77	47	124
Tributary-C	Sta. 0+000/ 4+000	4,000	80	170	4	0	0	0	3	60	30	52	82
	Sta. 4+000/ 5+000	1,000	80	183	0	0	0	0	0	5	2	2	4
	Sub-Total	5,000		353	4	0	0	0	3	65	32	54	86
Mangahan Diversion	Sta. 6+800/ 6+100	700	570	1,059	18	0	0	0	0	219	159	65	224
	Sta. 6+100/ 4+500	1,600	520	1,023	0	0	0	0	0	170	156	51	207
	Sta. 4+500/ 3+000	1,500	340	499	29	0	0	0	0	114	56	34	90
	Sub-Total	3,800		2,581	47	0	0	0	0	503	371	150	521
	Total	40,200		6,100	242	0	0	0	37	1,630	970	907	1,877

表5．3－1(3/4) フレームワークプランの建設費

MALABON-TULLAHAN RIVER IMPROVEMENT (100-Yr)

River	Stretch	Length (M)	Design Discharge (m3/s)	Required Works: Exca. (1000m3)	Embank. (1000m3)	Revet. (1000m2)	Concrete (1000m3)	Gate (ton)	Re.Bridge (place)	Land Acq. (1000m2)	Construction Cost: Civil Works (mil.Peso)	L.A./Compen. (mil.Peso)	Total (mil.Peso)
Malabon River	Sta. 0+000/ 2+835	2,835	570	1,132	140	68	0	0	3	75	156	90	246
	Sta. 2+835/ 4+377	1,542	550	198	59	20	0	0	0	42	36	50	87
	Sta. 4+377/ 5+427	1,050	520	77	91	11	0	0	3	15	94	18	112
	Sub-Total	5,427		1,407	289	99	0	0	6	132	287	158	445
Tullahan River	Sta. 0+000/ 4+800	4,800	480	452	160	0	0	0	0	87	280	104	384
	Sta. 4+800/18+000	13,200	330	23	0	0	0	0	0	26	47	31	78
	Sta.18+000/20+500	2,500	240	11	24	0	0	0	0	7	16	8	24
	Sta.20+500/21+500	1,000	240	11	0	0	0	0	0	2	5	2	7
	Sub-Total	21,500		497	184	0	0	0	0	122	347	146	493
	Total	26,927		1,904	473	99	0	0	6	254	634	305	938

SOUTH PARANAQUE LAS PINAS RIVER IMPROVEMENT (100-Yr)

River	Stretch	Length (M)	Design Discharge (m3/s)	Required Works: Exca. (1000m3)	Embank. (1000m3)	Revet. (1000m2)	Concrete (1000m3)	Gate (ton)	Re.Bridge (place)	Land Acq. (1000m2)	Construction Cost: Civil Works (mil.Peso)	L.A./Compen. (mil.Peso)	Total (mil.Peso)
Las Pinas River	Sta. 0+000/ 1+780	1,780	250	227	100	3	0	0	2	32	132	38	171
	Sta. 1+780/ 6+395	4,615	220	624	118	25	0	0	2	135	151	162	313
	Sta. 6+395/ 7+395	1,000	130	38	0	7	0	0	0	4	15	5	20
	Sub-Total	7,395		889	218	35	0	0	4	171	298	205	503
South Paranaque River	Sta. 0+000/ 0+560	560	630	95	12	4	0	0	0	5	26	6	32
	Sta.D0+000/D0+400	400	630	95	24	0	0	0	0	2	64	2	67
	Sta.D0+400/S0+000	400	430	113	18	0	0	0	0	11	14	13	27
	Sta.S0+000/S1+200	1,200	430	302	86	0	0	0	0	46	45	37	82
	Sta.S1+200/S2+600	1,400	370	340	39	0	0	0	0	72	53	58	110
	Sta.S2+600/S3+600	1,000	370	113	3	0	0	0	0	20	13	16	29
	Sub-Total	4,960		1,060	183	4	0	0	0	156	214	132	346
Dongalo River	Sta. 0+000/ 2+600	2,600	200	265	48	16	0	0	0	30	80	24	104
	Sta. 2+600/ 3+600	1,000	200	38	2	7	0	0	0	8	16	6	23
	Sub-Total	3,600		302	50	23	0	0	0	38	97	30	127
	Total	15,955		2,251	451	62	0	0	4	365	609	368	977

表5．3－1(4/4) フレームワークプランの建設費

DRAINAGE IMPROVEMENT(10-Yr)

Drainage Area	Area	Required Works												Construction Cost		
		Pump Station		Gate		Channel Impvt.	Open Cha. Const.	Closed Cha. Const.	Ring Dike/ Lake Dike	Regulation Pond		Reconst. Bridge	Land Acq.	Civil Works	L.A./Compen.	Total
	(km2)	(site)	(m3/s)	(site)	(ton)	(m)	(m)	(m)	(m)	(site)	(1000m3)	(place)	(1000m2)	(mil.Peso)	(mil.Peso)	(mil.Peso)
North Manila & Suburbs	28.6	3	15.5	1	15	7,950	0	5,750	0	0	0	1	6	1,496	17	1,513
South Manila & Suburbs	43.1	1	5.3	2	25	7,750	0	0	0	0	0	3	3	909	9	918
Sub-Total	71.7	4	20.8	3	40	15,700	0	5,750	0	0	0	4	9	2,405	26	2,431
Malabon-Navotas	24.9	8	76.1	16	420	5,100	5,600	800	22,000	0	0	11	119	1,246	48	1,294
East of Mangahan	8.8	4	31.1	4	90	1,100	7,300	0	1,800	2	60	2	57	251	35	286
West of Mangahan	38.1	5	147.6	10	350	34,100	11,000	1,450	8,900	4	776	26	372	2,066	260	2,327
Sub-Total	71.8	17	254.8	30	860	40,300	23,900	2,250	32,700	6	836	39	548	3,563	344	3,906
San Juan	12.7	9	52.7	13	128	1,300	0	12,300	3,400	0	0	8	7	1,197	2	1,199
Mandaluyong Pasig	15.9	3	23.0	3	47	2,500	0	8,800	0	0	0	5	9	847	9	856
Marikina	13.0	0	0.0	1	10	0	1,000	2,600	0	0	0	2	23	179	9	188
Paranaque Laspinas	15.4	2	19.8	8	195	4,800	650	0	0	0	0	3	47	723	18	741
Valenzuela	18.4	3	10.9	1	15	12,900	500	0	8,000	0	0	4	38	318	15	333
Sub-Total	75.4	17	106.4	26	396	21,500	2,150	23,700	11,400	0	0	22	124	3,263	54	3,317
Total	218.9	38	382.0	59	1,296	77,500	26,050	31,700	44,100	6	836	65	681	9,231	424	9,655

表6．3－1(1/3) 河川による洪水氾濫水位

Name of Station	Station No.	Inundation Water Stage (El.m) 100-yr.	50-yr.	30-yr	20-yr.	10-yr.	5-yr.	2-yr.
Pasig-Marikina River								
(Pasig River)								
P-1	1+900	11.73	11.69	11.65	11.64	11.60	11.55	11.49
P-2	2+980	12.24	12.16	12.07	12.06	11.97	11.86	11.71
P-3	3+935	12.47	12.38	12.27	12.25	12.14	12.01	11.83
P-4	4+695	12.58	12.47	12.36	12.34	12.22	12.08	11.88
P-5	5+605	12.85	12.73	12.60	12.58	12.44	12.28	12.04
P-6	6+480	13.08	12.95	12.81	12.78	12.63	12.45	12.18
P-7	7+295	13.32	13.18	13.02	12.99	12.82	12.61	12.31
P-8	8+095	13.37	13.23	13.08	13.05	12.88	12.67	12.37
P-9	9+695	13.85	13.69	13.51	13.47	13.28	13.02	12.65
P-10	10+745	13.92	13.77	13.59	13.51	13.36	13.09	12.70
P-11	11+495	14.02	13.86	13.68	13.64	13.45	13.17	12.76
P-12	12+315	13.14	13.99	13.81	13.77	13.58	13.28	12.84
P-13	13+295	14.30	14.15	13.97	13.93	13.73	13.41	12.94
P-14	14+290	14.38	14.23	14.06	14.01	13.82	13.49	13.01
P-15	15+295	14.62	14.48	14.31	14.26	14.07	13.71	13.18
P-16	16+315	14.84	14.70	14.53	14.48	14.29	13.91	13.34
P-17	17+185	14.99	14.85	14.67	14.62	14.43	14.03	13.44
P-18	18+165	15.10	14.96	14.79	14.73	14.54	14.13	13.52
P-19	18+495	15.17	15.03	14.85	14.80	14.60	14.19	13.56
(Marikina River)								
M-1	0+980	15.23	15.09	14.92	14.86	14.67	14.25	13.61
M-2	1+780	15.27	15.13	14.96	14.90	14.70	14.28	13.64
M-3	2+710	15.34	15.20	15.02	14.96	14.76	14.33	13.68
M-4	3+700	15.41	15.26	15.09	15.02	14.82	14.38	13.72
M-5	4+660	15.52	15.36	15.18	15.12	14.90	14.46	13.79
M-6	5+595	15.71	15.55	15.35	15.28	15.05	14.61	13.92
M-7	6+635	15.21	16.03	15.83	15.75	15.49	15.03	14.32
M-8	7+615	18.09	17.82	17.52	17.41	17.03	16.43	15.58
M-9	8+575	18.93	18.65	18.34	18.22	17.83	17.19	16.29
M-10	9+465	19.43	19.15	18.83	18.72	18.31	17.66	16.74
M-11	10+410	19.69	19.42	19.11	19.00	18.61	17.98	17.09
M-12	11+175	20.10	19.83	19.52	19.41	19.02	18.38	17.46
M-13	12+125	20.90	20.60	20.27	20.15	19.73	19.04	18.06
M-14	13+120	21.32	21.01	20.66	20.54	20.07	19.39	18.43
M-15	14+120	21.67	21.34	20.98	20.84	20.33	19.65	18.68
M-16	15+120	22.86	22.45	22.02	21.86	21.22	20.47	19.43
M-17	16+120	23.31	22.86	22.39	22.21	21.52	20.76	19.70
M-18	17+120	23.44	23.00	22.54	22.38	21.72	21.00	20.08
M-19	18+120	23.76	23.33	22.89	22.73	22.10	21.46	20.68
M-20	19+220	23.95	23.53	23.08	22.93	22.30	21.67	20.90
M-21	19+850	24.00	23.58	23.14	22.98	22.36	21.74	20.97
M-22	20+600	24.17	23.77	23.37	22.21	22.68	22.16	21.60
M-23	21+400	24.78	24.46	24.15	24.01	23.52	23.09	22.77
M-24	22+150	25.44	25.18	24.93	24.79	24.22	23.72	23.36
M-25	23+080	26.11	25.86	25.62	25.48	25.09	24.74	24.39

表6．3－1(2/3) 河川による洪水氾濫水位

Name of Station	Station No.	Inundation Water Stage (El.m) 100-yr.	50-yr.	30-yr	20-yr.	10-yr.	5-yr.	2-yr.
(Marikina River, Cont'd)								
M-26	24+910	27.00	26.75	26.49	26.33	25.96	25.55	25.12
M-27	25+910	27.52	27.25	26.97	26.81	26.42	25.99	25.51
M-28	26+780	27.87	27.59	27.31	27.13	26.74	26.28	25.78
M-29	27+200	27.85	27.58	27.30	27.13	26.75	26.31	25.81
(Inundation Area: East Side Lowland of Mangahan)								
E-1	0+000	13.35	13.15	12.95	12.88	---	---	---
E-2	0+900	15.12	14.65	14.16	13.99	---	---	---
E-3	1+800	16.24	15.90	15.57	15.45	---	---	---
E-4	2+500	16.96	16.66	16.38	16.29	---	---	---
E-5	3+300	17.11	16.77	16.44	16.34	---	---	---
E-6	4+250	17.21	16.85	16.51	16.40	---	---	---
E-7	5+100	17.36	16.99	16.62	16.50	---	---	---
E-8	6+100	17.85	17.55	17.26	17.17	---	---	---
E-9	7+300	18.82	18.56	18.30	18.22	---	---	---
E-10	8+300	19.58	19.32	19.03	18.90	---	---	---
E-11	9+300	20.25	19.99	19.72	19.60	---	---	---
E-12	10+200	20.83	20.54	20.12	20.09	---	---	---
(Inundation Area: West Side Lowland of Mangahan)								
W-1	0+000	12.57	12.54	12.52	12.51	---	---	---
W-2	1+000	12.77	12.66	12.58	12.56	---	---	---
W-3	2+000	13.32	13.18	13.04	13.00	---	---	---
W-4	3+000	13.94	13.75	13.56	13.49	---	---	---
W-5	4+000	14.08	13.87	13.64	13.57	---	---	---
W-6	5+000	14.59	14.44	14.26	14.20	---	---	---
W-7	5+800	15.27	15.13	14.96	14.90	---	---	---
(San Juan River)								
S-1	0+000	13.60	13.45	13.30	13.25	13.10	12.85	12.50
S-2	1+000	14.18	14.02	13.90	13.81	13.61	13.37	13.02
S-3	2+000	14.56	14.40	14.29	14.19	13.96	13.74	13.40
S-4	2+975	15.31	15.16	15.09	14.96	14.71	14.52	14.20
S-5	4+130	16.32	16.15	16.10	15.94	15.64	15.44	15.09
S-6	5+130	16.79	16.63	16.57	16.41	16.12	15.93	15.59
S-7	6+000	17.25	17.10	17.04	16.89	16.62	16.44	16.12
S-8	7+000	18.06	17.91	17.85	17.70	17.43	17.25	16.93
S-9	7+690	18.61	18.45	18.39	18.23	17.96	17.78	17.50

表6．3－1(3/3) 河川による洪水氾濫水位

Name of Station	Station No.	Inundation Water Stage (El.m) 100-yr.	50-yr.	30-yr	20-yr.	10-yr.	5-yr.	2-yr.
Buli-Baho-Mahaba River								
(Buli River)								
Bu-1	1+000	15.30	15.10	14.80	14.45	14.20	14.10	14.00
Bu-2	2+000	16.75	16.68	16.62	16.61	16.58	16.53	16.46
(Baho River)								
Ba-1	3+000	16.10	15.80	15.60	15.40	15.30	15.10	15.00
Ba-2	4+000	17.42	17.34	17.27	17.25	17.19	17.11	17.02
Ba-3	5+000	19.42	19.20	19.01	18.94	18.79	18.54	18.22
Ba-4	6+000	17.70	17.57	17.44	17.38	17.27	17.06	16.63
Ba-5	7+000	18.56	18.43	18.32	18.27	18.20	17.99	17.51
Ba-6	8+000	19.75	19.57	19.40	19.34	19.24	18.91	18.09
Ba-7	9+000	17.00	17.00	17.00	17.00	17.00	17.00	17.00
(Mahaba River)								
Ma-1	3+000	16.90	16.70	16.50	16.20	16.10	15.90	15.70
Ma-2	4+000	19.19	19.05	18.96	18.93	18.83	18.71	18.59
Ma-3	5+000	21.68	21.56	21.46	21.43	21.39	21.34	21.26
Pond-1		19.36	19.33	19.32	19.31	19.30	19.27	19.20
Pond-2		14.42	14.30	14.20	14.16	14.05	13.93	13.78
Malabon-Tullahan River								
(Tullahan River)								
T-1	1+000	12.95	12.75	12.66	12.53	12.32	12.18	11.97
T-2	2+000	13.64	13.48	13.40	13.28	13.11	12.92	12.62
T-3	3+000	14.91	14.62	14.49	14.29	13.95	13.70	13.24
T-4	4+000	15.60	15.40	15.20	15.10	14.80	14.60	14.10
T-5	5+000	17.20	17.10	17.00	16.80	16.50	16.30	15.80
Pond-3		12.97	12.83	12.76	12.67	12.52	12.38	11.93
South Paranaque-Las Pinas River								
(Dongaro River)								
D-1								
D-2	2+000	13.55	13.34	13.27	13.21	13.12	13.01	12.84
D-3	3+000	15.96	15.75	15.62	15.53	15.39	15.23	15.03
(South Paranaque River)								
S-1	3+200	14.50	14.40	14.20	14.10	14.00	13.80	13.60
(Las Pinas River)								
L-1								
L-2	5+000	17.04	16.91	16.81	16.74	16.59	16.41	16.22
L-3	6+000	18.81	18.60	18.52	18.44	18.33	18.24	18.14
Pond-4		12.19	12.06	11.95	11.91	11.85	11.78	11.69

表6．3－2(1/5) 内水氾濫水位

Pond Name	Scale of Facilities	2-Yr Rainfall		3-Yr Rainfall		5-Yr Rainfall		10-Yr Rainfall		30-Yr Rainfall		50-Yr Rainfall		100-Yr Rainfall	
		Max. Water Level (EL. m)	Max. Flooded Area (km^2)	Max. Water Level (EL. m)	Max. Flooded Area (km^2)	Max. Water Level (EL. m)	Max. Flooded Area (km^2)	Max. Water Level (EL. m)	Max. Flooded Area (km^2)	Max. Water Level (EL. m)	Max. Flooded Area (km^2)	Max. Water Level (EL. m)	Max. Flooded Area (km^2)	Max. Water Level (EL. m)	Max. Flooded Area (km^2)
MANILA AND SUBURBS (NORTH MANILA)															
NM-1	Existing	12.50	2.15	12.56	2.79	12.63	3.68	12.72	4.83	12.93	7.46	13.03	8.03	13.14	8.27
	2-Yr	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3-Yr	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-Yr	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10-Yr	-	-	-	-	-	-	-	-	12.33	1.26	12.36	1.34	12.38	1.39
NM-2	Existing	11.97	0.20	11.99	0.20	12.01	0.21	12.05	0.21	12.14	0.22	12.19	0.23	12.28	0.24
	2-Yr	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3-Yr	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-Yr	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10-Yr	-	-	-	-	-	-	-	-	11.97	0.20	11.97	0.20	11.97	0.20
NM-3	Existing	12.20	1.39	12.28	1.78	12.38	2.34	12.51	2.98	12.69	3.89	12.80	4.44	12.94	5.14
	2-Yr	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3-Yr	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-Yr	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10-Yr	-	-	-	-	-	-	-	-	12.17	1.25	12.18	1.26	12.19	1.35
NM-4	Existing	12.30	0.13	12.38	0.16	12.47	0.20	12.53	0.24	12.67	0.34	12.76	0.41	12.87	0.49
	2-Yr	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3-Yr	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-Yr	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10-Yr	-	-	-	-	-	-	-	-	11.98	0.01	11.99	0.01	11.99	0.01
NM-5	Existing	12.54	0.58	12.56	0.60	12.59	0.64	12.64	0.71	12.77	0.88	12.86	1.00	12.96	1.14
	2-Yr	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3-Yr	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-Yr	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10-Yr	-	-	-	-	-	-	-	-	12.49	0.51	12.50	0.52	12.51	0.53
MANILA AND SUBURBS (SOUTH MANILA)															
SM-1	Existing	12.39	0.76	12.47	0.90	12.52	0.99	12.61	1.16	12.83	1.57	12.98	1.81	13.13	1.86
	2-Yr	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3-Yr	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-Yr	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10-Yr	-	-	-	-	-	-	-	-	12.25	0.51	12.29	0.59	12.39	0.76
SM-2	Existing	12.03	1.10	12.06	1.32	12.10	1.64	12.19	2.26	12.41	3.75	12.49	4.33	12.57	4.76
	2-Yr	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3-Yr	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-Yr	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10-Yr	-	-	-	-	-	-	-	-	12.05	1.29	12.08	1.46	12.12	1.78
SM-3	Existing	12.06	0.12	12.08	0.15	12.10	0.18	12.15	0.24	12.24	0.37	12.32	0.47	12.45	0.64
	2-Yr	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3-Yr	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-Yr	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10-Yr	-	-	-	-	-	-	-	-	11.97	0.01	11.97	0.01	11.97	0.02
SM-4	Existing	12.07	0.73	12.09	0.85	12.12	1.00	12.19	1.31	12.35	2.03	12.46	2.56	12.52	2.73
	2-Yr	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3-Yr	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-Yr	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10-Yr	-	-	-	-	-	-	-	-	11.96	0.25	11.97	0.28	11.98	0.31
SM-5	Existing	12.20	1.61	12.31	2.09	12.45	2.66	12.53	3.41	12.72	5.09	12.86	6.39	13.03	7.52
	2-Yr	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3-Yr	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5-Yr	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10-Yr	-	-	-	-	-	-	-	-	12.35	2.24	12.44	2.66	12.51	3.22
MALABON-NAVOTAS															
MT-4-1	Existing	12.51	0.76	12.59	0.82	12.71	0.92	12.92	1.08	13.27	1.36	13.46	1.51	13.63	1.54
	2-Yr	-	-	12.20	0.48	12.24	0.51	12.27	0.54	12.31	0.58	12.32	0.60	12.36	0.63
	3-Yr	-	-	-	-	12.20	0.48	12.24	0.52	12.28	0.55	12.30	0.57	12.33	0.60
	5-Yr	-	-	-	-	-	-	12.20	0.48	12.25	0.53	12.27	0.55	12.29	0.57
	10-Yr	-	-	-	-	-	-	-	-	12.22	0.50	12.23	0.51	12.27	0.54
MT-4-2	Existing	12.59	0.33	12.66	0.37	12.77	0.42	13.01	0.52	13.41	0.70	13.56	0.75	13.72	0.80
	2-Yr	-	-	12.10	0.10	12.11	0.10	12.15	0.12	12.23	0.16	12.25	0.18	12.31	0.21
	3-Yr	-	-	-	-	12.10	0.10	12.12	0.11	12.17	0.14	12.20	0.15	12.26	0.18
	5-Yr	-	-	-	-	-	-	12.10	0.10	12.14	0.12	12.15	0.13	12.21	0.15
	10-Yr	-	-	-	-	-	-	-	-	12.11	0.11	12.12	0.11	12.15	0.13

表6．3－2(2/5) 内水氾濫水位

Pond Name	Scale of Facilities	2-Yr Rainfall		3-Yr Rainfall		5-Yr Rainfall		10-Yr Rainfall		30-Yr Rainfall		50-Yr Rainfall		100-Yr Rainfall	
		Max. Water Level (EL. m)	Max. Flooded Area (km^2)	Max. Water Level (EL. m)	Max. Flooded Area (km^2)	Max. Water Level (EL. m)	Max. Flooded Area (km^2)	Max. Water Level (EL. m)	Max. Flooded Area (km^2)	Max. Water Level (EL. m)	Max. Flooded Area (km^2)	Max. Water Level (EL. m)	Max. Flooded Area (km^2)	Max. Water Level (EL. m)	Max. Flooded Area (km^2)
MALABON-NAVOTAS															
MA-1	Existing	10.98	0.47	11.03	0.58	11.07	0.73	11.14	0.96	11.25	1.33	11.31	1.53	11.39	1.79
	2-Yr	-	-	10.73	0.37	10.78	0.39	10.89	0.44	11.03	0.59	11.07	0.72	11.11	0.85
	3-Yr	-	-	-	-	10.73	0.37	10.80	0.40	10.95	0.46	11.02	0.55	11.06	0.68
	5-Yr	-	-	-	-	-	-	10.74	0.38	10.83	0.41	10.91	0.44	11.01	0.51
	10-Yr	-	-	-	-	-	-	-	-	10.75	0.38	10.79	0.40	10.86	0.42
MA-2	Existing	10.79	0.64	10.85	0.67	10.93	0.71	11.03	0.81	11.12	1.05	11.17	1.19	11.24	1.36
	2-Yr	-	-	10.78	0.63	10.83	0.66	10.93	0.71	11.05	0.87	11.09	0.98	11.14	1.11
	3-Yr	-	-	-	-	10.78	0.63	10.84	0.66	10.98	0.73	11.04	0.84	11.09	0.98
	5-Yr	-	-	-	-	-	-	10.79	0.64	10.88	0.68	10.95	0.72	11.03	0.82
	10-Yr	-	-	-	-	-	-	-	-	10.81	0.65	10.84	0.66	10.92	0.70
MA-3	Existing	11.06	1.36	11.11	1.43	11.16	1.51	11.25	1.64	11.38	1.83	11.45	1.93	11.53	2.01
	2-Yr	-	-	10.83	0.55	10.88	0.77	10.97	1.15	11.07	1.38	11.12	1.45	11.18	1.54
	3-Yr	-	-	-	-	10.83	0.55	10.89	0.81	11.01	1.29	11.05	1.35	11.11	1.43
	5-Yr	-	-	-	-	-	-	10.84	0.60	10.93	0.98	10.99	1.24	11.04	1.34
	10-Yr	-	-	-	-	-	-	-	-	10.86	0.68	10.89	0.81	10.96	1.11
MA-4	Existing	11.06	0.19	11.09	0.21	11.13	0.23	11.19	0.27	11.29	0.33	11.35	0.36	11.42	0.40
	2-Yr	-	-	10.83	0.07	10.88	0.09	10.97	0.14	11.07	0.20	11.12	0.23	11.18	0.26
	3-Yr	-	-	-	-	10.83	0.07	10.89	0.10	11.01	0.16	11.05	0.18	11.11	0.22
	5-Yr	-	-	-	-	-	-	10.84	0.07	10.93	0.12	10.99	0.15	11.04	0.18
	10-Yr	-	-	-	-	-	-	-	-	10.86	0.08	10.89	0.10	10.96	0.13
MA-5	Existing	11.17	0.72	11.24	0.74	11.33	0.76	11.48	0.79	11.62	1.02	11.70	1.16	11.79	1.34
	2-Yr	-	-	10.83	0.10	10.88	0.28	10.97	0.59	11.07	0.70	11.12	0.71	11.18	0.73
	3-Yr	-	-	-	-	10.83	0.10	10.89	0.31	11.01	0.69	11.05	0.70	11.11	0.71
	5-Yr	-	-	-	-	-	-	10.84	0.14	10.93	0.45	10.99	0.66	11.04	0.70
	10-Yr	-	-	-	-	-	-	-	-	10.86	0.21	10.89	0.31	10.96	0.55
MA-6	Existing	11.04	0.75	11.08	0.78	11.13	0.83	11.22	0.91	11.35	1.04	11.43	1.10	11.52	1.18
	2-Yr	-	-	10.92	0.51	10.94	0.57	10.98	0.67	11.05	0.76	11.09	0.79	11.14	0.84
	3-Yr	-	-	-	-	10.92	0.51	10.94	0.58	11.00	0.71	11.03	0.74	11.08	0.78
	5-Yr	-	-	-	-	-	-	10.92	0.52	10.96	0.62	10.99	0.68	11.02	0.73
	10-Yr	-	-	-	-	-	-	-	-	10.93	0.54	10.94	0.57	10.97	0.64
MA-7	Existing	11.40	0.80	11.50	0.90	11.59	0.91	11.76	0.92	12.02	0.93	12.16	0.93	12.33	0.94
	2-Yr	-	-	11.23	0.62	11.27	0.66	11.35	0.75	11.49	0.90	11.55	0.91	11.61	0.91
	3-Yr	-	-	-	-	11.23	0.62	11.28	0.67	11.40	0.80	11.47	0.87	11.54	0.91
	5-Yr	-	-	-	-	-	-	11.24	0.63	11.31	0.71	11.36	0.76	11.45	0.85
	10-Yr	-	-	-	-	-	-	-	-	11.25	0.64	11.28	0.67	11.34	0.73
MA-8	Existing	13.10	0.75	13.12	0.86	13.16	1.01	13.22	1.30	13.38	2.01	13.49	2.51	13.57	2.58
	2-Yr	-	-	13.00	0.30	13.01	0.32	13.01	0.36	13.03	0.42	13.03	0.45	13.05	0.50
	3-Yr	-	-	-	-	13.00	0.30	13.01	0.33	13.02	0.38	13.02	0.40	13.04	0.45
	5-Yr	-	-	-	-	-	-	13.00	0.30	13.01	0.34	13.02	0.36	13.02	0.40
	10-Yr	-	-	-	-	-	-	-	-	13.00	0.31	13.01	0.32	13.01	0.36
MA-9	Existing	11.29	0.12	11.32	0.17	11.37	0.17	11.45	0.21	11.56	0.24	11.60	0.24	11.67	0.25
	2-Yr	-	-	11.21	0.09	11.22	0.09	11.24	0.10	11.29	0.13	11.32	0.14	11.36	0.16
	3-Yr	-	-	-	-	11.21	0.09	11.23	0.09	11.26	0.11	11.28	0.12	11.32	0.14
	5-Yr	-	-	-	-	-	-	11.21	0.09	11.23	0.10	11.25	0.10	11.27	0.12
	10-Yr	-	-	-	-	-	-	-	-	11.21	0.08	11.22	0.09	11.23	0.09
MA-10	Existing	12.21	0.13	12.26	0.17	12.32	0.21	12.45	0.29	12.57	0.40	12.62	0.47	12.70	0.56
	2-Yr	-	-	12.00	0.00	12.01	0.01	12.02	0.02	12.05	0.03	12.06	0.04	12.08	0.05
	3-Yr	-	-	-	-	12.00	0.00	12.01	0.01	12.04	0.02	12.05	0.03	12.07	0.04
	5-Yr	-	-	-	-	-	-	12.00	0.00	12.02	0.01	12.03	0.02	12.05	0.03
	10-Yr	-	-	-	-	-	-	-	-	12.01	0.00	12.01	0.01	12.03	0.02
MA-11	Existing	11.11	0.23	11.17	0.24	11.24	0.25	11.37	0.28	11.53	0.32	11.59	0.37	11.66	0.42
	2-Yr	-	-	10.92	0.15	10.94	0.17	10.97	0.19	11.02	0.21	11.05	0.22	11.10	0.23
	3-Yr	-	-	-	-	10.92	0.15	10.94	0.17	10.99	0.20	11.01	0.21	11.04	0.22
	5-Yr	-	-	-	-	-	-	10.92	0.15	10.95	0.18	10.96	0.19	11.00	0.21
	10-Yr	-	-	-	-	-	-	-	-	10.93	0.16	10.94	0.17	10.96	0.18
MA-12	Existing	13.05	0.05	13.13	0.06	13.25	0.07	13.46	0.08	13.63	0.10	13.72	0.11	13.83	0.12
	2-Yr	-	-	12.50	0.00	12.51	0.00	12.53	0.00	12.57	0.01	12.59	0.01	12.62	0.01
	3-Yr	-	-	-	-	12.50	0.00	12.52	0.00	12.55	0.00	12.56	0.01	12.60	0.01
	5-Yr	-	-	-	-	-	-	12.50	0.00	12.53	0.00	12.54	0.00	12.57	0.01
	10-Yr	-	-	-	-	-	-	-	-	12.51	0.00	12.52	0.00	12.54	0.00

表6．3－2(3/5) 内水氾濫水位

Pond Name	Scale of Facilities	2-Yr Rainfall		3-Yr Rainfall		5-Yr Rainfall		10-Yr Rainfall		30-Yr Rainfall		50-Yr Rainfall		100-Yr Rainfall	
		Max. Water Level (EL. m)	Max. Flooded Area (km^2)	Max. Water Level (EL. m)	Max. Flooded Area (km^2)	Max. Water Level (EL. m)	Max. Flooded Area (km^2)	Max. Water Level (EL. m)	Max. Flooded Area (km^2)	Max. Water Level (EL. m)	Max. Flooded Area (km^2)	Max. Water Level (EL. m)	Max. Flooded Area (km^2)	Max. Water Level (EL. m)	Max. Flooded Area (km^2)
EAST OF MANGAHAN															
EM-1	Existing	13.45	0.20	13.58	0.23	13.75	0.29	14.10	0.38	14.44	0.41	14.54	0.43	14.61	0.44
	2-Yr	-	-	13.00	0.13	13.07	0.15	13.33	0.19	13.44	0.20	14.54	0.43	14.61	0.44
	3-Yr	-	-	-	-	13.05	0.15	13.28	0.19	13.35	0.20	14.54	0.43	14.61	0.44
	5-Yr	-	-	-	-	-	-	13.24	0.19	13.29	0.19	14.54	0.43	14.61	0.44
	10-Yr	-	-	-	-	-	-	-	-	13.25	0.19	14.54	0.43	14.61	0.44
EM-2	Existing	12.94	0.24	13.14	0.39	13.32	0.59	13.53	0.81	13.79	1.09	13.89	1.12	14.08	1.24
	2-Yr	-	-	12.73	0.23	12.77	0.23	12.82	0.23	12.92	0.24	13.89	1.12	14.08	1.24
	3-Yr	-	-	-	-	12.73	0.23	12.77	0.23	12.84	0.23	13.89	1.12	14.08	1.24
	5-Yr	-	-	-	-	-	-	12.74	0.23	12.79	0.23	13.89	1.12	14.08	1.24
	10-Yr	-	-	-	-	-	-	-	-	12.75	0.23	13.89	1.12	14.08	1.24
EM-3	Existing	12.80	0.24	13.01	0.40	13.16	0.63	13.25	0.77	13.65	1.32	13.86	1.56	14.08	1.80
	2-Yr	-	-	12.73	0.19	12.76	0.21	12.82	0.25	12.95	0.34	13.86	1.56	14.08	1.80
	3-Yr	-	-	-	-	12.73	0.19	12.77	0.22	12.86	0.28	13.86	1.56	14.08	1.80
	5-Yr	-	-	-	-	-	-	12.73	0.19	12.80	0.24	13.86	1.56	14.08	1.80
	10-Yr	-	-	-	-	-	-	-	-	12.75	0.20	13.86	1.56	14.08	1.80
EM-4	Existing	12.45	0.29	12.63	0.41	12.85	0.58	13.22	0.75	13.65	0.86	13.86	0.92	14.08	1.01
	2-Yr	-	-	12.25	0.19	12.33	0.23	12.49	0.31	12.63	0.41	13.86	0.92	14.08	1.01
	3-Yr	-	-	-	-	12.25	0.19	12.35	0.24	12.54	0.34	13.86	0.92	14.08	1.01
	5-Yr	-	-	-	-	-	-	12.27	0.20	12.43	0.28	13.86	0.92	14.08	1.01
	10-Yr	-	-	-	-	-	-	-	-	12.31	0.22	13.86	0.92	14.08	1.01
WEST OF MANGAHAN															
WM-1	Existing	12.58	1.73	12.65	2.10	12.85	3.16	13.22	4.73	13.65	5.84	13.86	6.02	14.08	6.30
	2-Yr	-	-	12.24	0.95	12.29	1.01	12.36	1.11	12.48	1.27	13.86	6.02	14.08	6.30
	3-Yr	-	-	-	-	12.24	0.95	12.30	1.03	12.40	1.16	13.86	6.02	14.08	6.30
	5-Yr	-	-	-	-	-	-	12.25	0.96	12.34	1.08	13.86	6.02	14.08	6.30
	10-Yr	-	-	-	-	-	-	-	-	12.27	0.99	13.86	6.02	14.08	6.30
WM-2	Existing	12.15	1.11	12.50	2.64	12.85	3.68	13.22	4.32	13.65	4.69	13.86	4.87	14.08	5.01
	2-Yr	-	-	11.77	0.33	11.85	0.38	12.00	0.46	12.08	0.81	13.86	4.87	14.08	5.01
	3-Yr	-	-	-	-	11.77	0.33	11.88	0.39	12.03	0.59	13.86	4.87	14.08	5.01
	5-Yr	-	-	-	-	-	-	11.80	0.35	12.01	0.50	13.86	4.87	14.08	5.01
	10-Yr	-	-	-	-	-	-	-	-	11.87	0.39	13.86	4.87	14.08	5.01
WM-3	Existing	12.17	1.54	12.50	2.96	12.85	4.51	13.22	5.28	13.65	5.54	13.86	5.70	14.08	5.87
	2-Yr	-	-	11.76	0.60	11.83	0.66	11.95	0.77	12.06	1.07	13.86	5.70	14.08	5.87
	3-Yr	-	-	-	-	11.76	0.60	11.87	0.70	12.02	0.90	13.86	5.70	14.08	5.87
	5-Yr	-	-	-	-	-	-	11.79	0.63	11.97	0.78	13.86	5.70	14.08	5.87
	10-Yr	-	-	-	-	-	-	-	-	11.84	0.67	13.86	5.70	14.08	5.87
WM-4	Existing	12.54	2.59	12.63	3.00	12.85	3.85	13.22	5.19	13.65	6.24	13.86	6.43	14.08	6.67
	2-Yr	-	-	12.00	0.91	12.05	0.97	12.12	1.04	12.26	1.70	13.86	6.43	14.08	6.67
	3-Yr	-	-	-	-	12.00	0.91	12.07	0.99	12.18	1.46	13.86	6.43	14.08	6.67
	5-Yr	-	-	-	-	-	-	12.01	0.94	12.11	1.24	13.86	6.43	14.08	6.67
	10-Yr	-	-	-	-	-	-	-	-	12.05	1.06	13.86	6.43	14.08	6.67
WM-5	Existing	12.18	0.68	12.50	0.89	12.85	1.35	13.22	1.69	13.65	1.94	13.86	2.04	14.08	2.14
	2-Yr	-	-	11.94	0.54	11.99	0.56	12.07	0.61	12.21	0.70	13.86	2.04	14.08	2.14
	3-Yr	-	-	-	-	11.94	0.54	12.01	0.57	12.11	0.63	13.86	2.04	14.08	2.14
	5-Yr	-	-	-	-	-	-	11.95	0.54	12.04	0.59	13.86	2.04	14.08	2.14
	10-Yr	-	-	-	-	-	-	-	-	11.98	0.55	13.86	2.04	14.08	2.14
SAN JUAN															
SJ-5-1	Existing	16.19	0.26	16.47	0.27	16.68	0.31	17.03	0.36	17.60	0.45	17.91	0.50	18.29	0.56
	2-Yr	-	-	15.64	0.24	15.66	0.24	15.68	0.24	15.72	0.24	15.75	0.24	15.78	0.24
	3-Yr	-	-	-	-	15.66	0.24	15.67	0.24	15.71	0.24	15.73	0.24	15.76	0.24
	5-Yr	-	-	-	-	-	-	15.67	0.24	15.70	0.24	15.72	0.24	15.74	0.24
	10-Yr	-	-	-	-	-	-	-	-	15.69	0.24	15.71	0.24	15.72	0.24
SJ-5-2	Existing	15.80	0.06	15.93	0.06	16.09	0.06	16.36	0.07	16.59	0.08	16.69	0.09	16.81	0.10
	2-Yr	-	-	15.57	0.05	15.58	0.05	15.59	0.05	15.61	0.05	15.62	0.05	15.64	0.05
	3-Yr	-	-	-	-	15.58	0.05	15.59	0.05	15.61	0.05	15.62	0.05	15.64	0.05
	5-Yr	-	-	-	-	-	-	15.59	0.05	15.61	0.05	15.61	0.05	15.63	0.05
	10-Yr	-	-	-	-	-	-	-	-	15.60	0.05	15.61	0.05	15.63	0.05
SJ-7-1	Existing	14.01	0.33	14.21	0.37	14.46	0.42	14.64	0.48	14.93	0.58	15.09	0.63	15.29	0.70
	2-Yr	-	-	13.71	0.27	13.76	0.28	13.82	0.29	13.90	0.31	13.93	0.31	13.98	0.32
	3-Yr	-	-	-	-	13.71	0.27	13.77	0.28	13.85	0.30	13.89	0.31	13.94	0.32
	5-Yr	-	-	-	-	-	-	13.72	0.27	13.80	0.29	13.83	0.29	13.89	0.31
	10-Yr	-	-	-	-	-	-	-	-	13.73	0.27	13.76	0.28	13.81	0.29

表6．3－2(4/5) 内水氾濫水位

Pond Name	Scale of Facilities	2-Yr Rainfall Max. Water Level (EL. m)	2-Yr Rainfall Max. Flooded Area (km^2)	3-Yr Rainfall Max. Water Level (EL. m)	3-Yr Rainfall Max. Flooded Area (km^2)	5-Yr Rainfall Max. Water Level (EL. m)	5-Yr Rainfall Max. Flooded Area (km^2)	10-Yr Rainfall Max. Water Level (EL. m)	10-Yr Rainfall Max. Flooded Area (km^2)	30-Yr Rainfall Max. Water Level (EL. m)	30-Yr Rainfall Max. Flooded Area (km^2)	50-Yr Rainfall Max. Water Level (EL. m)	50-Yr Rainfall Max. Flooded Area (km^2)	100-Yr Rainfall Max. Water Level (EL. m)	100-Yr Rainfall Max. Flooded Area (km^2)
SAN JUAN															
SJ-7-2	Existing	14.25	0.09	14.50	0.10	14.67	0.11	14.97	0.13	15.45	0.16	15.71	0.18	16.04	0.20
	2-Yr	-	-	13.72	0.07	13.78	0.07	13.86	0.08	13.97	0.08	14.02	0.08	14.08	0.08
	3-Yr	-	-	-	-	13.71	0.07	13.77	0.07	13.88	0.08	13.92	0.08	13.99	0.08
	5-Yr	-	-	-	-	-	-	13.72	0.07	13.80	0.07	13.84	0.08	13.90	0.08
	10-Yr	-	-	-	-	-	-	-	-	13.73	0.07	13.76	0.07	13.81	0.07
SJ-8-1	Existing	14.19	0.09	14.45	0.10	14.64	0.11	14.93	0.12	15.41	0.14	15.68	0.16	16.02	0.17
	2-Yr	-	-	13.70	0.06	13.76	0.06	13.82	0.07	13.91	0.07	13.94	0.07	13.99	0.08
	3-Yr	-	-	-	-	13.71	0.06	13.76	0.07	13.85	0.07	13.88	0.07	13.94	0.07
	5-Yr	-	-	-	-	-	-	13.72	0.06	13.79	0.07	13.82	0.07	13.88	0.07
	10-Yr	-	-	-	-	-	-	-	-	13.73	0.06	13.75	0.06	13.81	0.07
SJ-8-2	Existing	14.13	0.06	14.38	0.07	14.59	0.07	14.87	0.08	15.35	0.10	15.61	0.10	15.94	0.11
	2-Yr	-	-	13.70	0.05	13.75	0.05	13.81	0.05	13.90	0.05	13.93	0.05	13.97	0.06
	3-Yr	-	-	-	-	13.71	0.05	13.76	0.05	13.85	0.05	13.88	0.05	13.93	0.05
	5-Yr	-	-	-	-	-	-	13.71	0.05	13.78	0.05	13.81	0.05	13.87	0.05
	10-Yr	-	-	-	-	-	-	-	-	13.73	0.05	13.75	0.05	13.80	0.05
SJ-9-1	Existing	12.77	0.13	12.89	0.18	13.03	0.24	13.28	0.34	13.55	0.44	13.64	0.45	13.75	0.47
	2-Yr	-	-	12.62	0.07	12.63	0.07	12.65	0.08	12.67	0.09	12.67	0.09	12.69	0.09
	3-Yr	-	-	-	-	12.63	0.07	12.65	0.08	12.67	0.09	12.67	0.09	12.68	0.09
	5-Yr	-	-	-	-	-	-	12.65	0.08	12.67	0.09	12.67	0.09	12.68	0.09
	10-Yr	-	-	-	-	-	-	-	-	12.66	0.09	12.67	0.09	12.68	0.09
SJ-9-2	Existing	12.98	0.26	13.18	0.31	13.43	0.39	13.66	0.43	14.02	0.48	14.21	0.51	14.45	0.55
	2-Yr	-	-	12.68	0.16	12.70	0.17	12.72	0.18	12.74	0.18	12.75	0.19	12.77	0.19
	3-Yr	-	-	-	-	12.69	0.17	12.71	0.17	12.73	0.18	12.74	0.19	12.76	0.19
	5-Yr	-	-	-	-	-	-	12.68	0.17	12.71	0.18	12.72	0.18	12.74	0.19
	10-Yr	-	-	-	-	-	-	-	-	12.70	0.17	12.71	0.18	12.73	0.18
SJ-9-3	Existing	13.00	0.08	13.20	0.11	13.46	0.14	13.67	0.15	14.01	0.17	14.19	0.18	14.42	0.19
	2-Yr	-	-	12.68	0.05	12.69	0.05	12.71	0.05	12.74	0.05	12.75	0.05	12.77	0.06
	3-Yr	-	-	-	-	12.68	0.05	12.70	0.05	12.72	0.05	12.73	0.05	12.75	0.05
	5-Yr	-	-	-	-	-	-	12.68	0.05	12.71	0.05	12.72	0.05	12.73	0.05
	10-Yr	-	-	-	-	-	-	-	-	12.70	0.05	12.70	0.05	12.72	0.05
SJ-10	Existing	12.89	0.26	12.99	0.31	13.07	0.37	13.20	0.47	13.41	0.62	13.50	0.66	13.60	0.67
	2-Yr	-	-	12.68	0.17	12.70	0.18	12.72	0.19	12.75	0.20	12.77	0.20	12.78	0.21
	3-Yr	-	-	-	-	12.68	0.17	12.71	0.18	12.74	0.19	12.75	0.20	12.77	0.21
	5-Yr	-	-	-	-	-	-	12.69	0.17	12.73	0.19	12.74	0.19	12.76	0.20
	10-Yr	-	-	-	-	-	-	-	-	12.70	0.17	12.71	0.18	12.73	0.19
MANDALUYONG-PASIG															
PM-5-1	Existing	16.94	0.67	17.13	0.80	17.38	0.98	17.77	1.26	18.44	1.73	18.61	1.85	18.81	1.99
	2-Yr	-	-	16.46	0.33	16.47	0.34	16.49	0.35	16.52	0.37	16.54	0.38	16.57	0.40
	3-Yr	-	-	-	-	16.46	0.33	16.48	0.34	16.50	0.36	16.52	0.37	16.54	0.39
	5-Yr	-	-	-	-	-	-	16.46	0.33	16.48	0.35	16.49	0.35	16.52	0.37
	10-Yr	-	-	-	-	-	-	-	-	16.47	0.34	16.48	0.34	16.49	0.35
PM-5-2	Existing	14.72	0.12	14.82	0.14	14.95	0.17	15.16	0.22	15.52	0.30	15.72	0.35	15.96	0.41
	2-Yr	-	-	14.46	0.06	14.47	0.06	14.47	0.06	14.49	0.07	14.49	0.07	14.51	0.07
	3-Yr	-	-	-	-	14.46	0.06	14.47	0.06	14.48	0.06	14.48	0.07	14.50	0.07
	5-Yr	-	-	-	-	-	-	14.46	0.06	14.47	0.06	14.48	0.06	14.49	0.07
	10-Yr	-	-	-	-	-	-	-	-	14.46	0.06	14.47	0.06	14.48	0.06
PM-7	Existing	13.46	1.46	13.53	1.49	13.62	1.52	13.77	1.58	14.01	1.68	14.13	1.73	14.30	1.79
	2-Yr	-	-	13.20	0.70	13.26	0.87	13.36	1.17	13.49	1.47	13.52	1.48	13.55	1.49
	3-Yr	-	-	-	-	13.20	0.70	13.27	0.91	13.42	1.34	13.48	1.47	13.52	1.48
	5-Yr	-	-	-	-	-	-	13.21	0.73	13.31	1.02	13.38	1.21	13.47	1.46
	10-Yr	-	-	-	-	-	-	-	-	13.23	0.79	13.27	0.90	13.35	1.13
MARIKINA															
PM-3-1	Existing	22.89	0.01	22.97	0.01	23.07	0.01	23.25	0.02	23.67	0.03	23.98	0.04	24.50	0.05
	2-Yr	-	-	22.50	0.00	22.51	0.00	22.53	0.00	22.57	0.00	22.59	0.00	22.63	0.00
	3-Yr	-	-	-	-	22.50	0.00	22.52	0.00	22.55	0.00	22.57	0.00	22.60	0.00
	5-Yr	-	-	-	-	-	-	22.50	0.00	22.53	0.00	22.54	0.00	22.57	0.00
	10-Yr	-	-	-	-	-	-	-	-	22.51	0.00	22.52	0.00	22.54	0.00
PM-3-2	Existing	22.71	0.01	22.75	0.01	22.81	0.02	22.91	0.02	23.16	0.04	23.34	0.05	23.65	0.06
	2-Yr	-	-	22.50	0.00	22.51	0.00	22.52	0.00	22.54	0.00	22.55	0.00	22.57	0.00
	3-Yr	-	-	-	-	22.50	0.00	22.51	0.00	22.53	0.00	22.54	0.00	22.55	0.00
	5-Yr	-	-	-	-	-	-	22.50	0.00	22.51	0.00	22.52	0.00	22.54	0.00
	10-Yr	-	-	-	-	-	-	-	-	22.51	0.00	22.51	0.00	22.52	0.00

表6．3－2(5/5) 内水氾濫水位

Pond Name	Scale of Facil-ities	2-Yr Rainfall		3-Yr Rainfall		5-Yr Rainfall		10-Yr Rainfall		30-Yr Rainfall		50-Yr Rainfall		100-Yr Rainfall	
		Max. Water Level (El. m)	Max. Flooded Area (km^2)	Max. Water Level (El. m)	Max. Flooded Area (km^2)	Max. Water Level (El. m)	Max. Flooded Area (km^2)	Max. Water Level (El. m)	Max. Flooded Area (km^2)	Max. Water Level (El. m)	Max. Flooded Area (km^2)	Max. Water Level (El. m)	Max. Flooded Area (km^2)	Max. Water Level (El. m)	Max. Flooded Area (km^2)
MARIKINA															
PM-3-3	Existing	21.51	0.04	21.73	0.05	22.01	0.06	22.51	0.08	22.77	0.11	22.97	0.13	23.31	0.16
	2-Yr	-	-	20.51	0.00	20.55	0.00	20.62	0.00	20.75	0.01	20.81	0.01	20.92	0.02
	3-Yr	-	-	-	-	20.52	0.00	20.56	0.00	20.68	0.01	20.73	0.01	20.83	0.01
	5-Yr	-	-	-	-	-	-	20.52	0.00	20.59	0.00	20.64	0.01	20.73	0.01
	10-Yr	-	-	-	-	-	-	-	-	20.53	0.00	20.56	0.00	20.64	0.01
PM-3-4	Existing	19.94	0.10	20.04	0.12	20.16	0.15	20.40	0.21	20.62	0.25	20.73	0.27	20.91	0.31
	2-Yr	-	-	19.51	0.00	19.53	0.01	19.56	0.01	19.63	0.03	19.66	0.04	19.71	0.05
	3-Yr	-	-	-	-	19.51	0.00	19.53	0.01	19.59	0.02	19.61	0.03	19.66	0.04
	5-Yr	-	-	-	-	-	-	19.51	0.00	19.55	0.01	19.57	0.02	19.61	0.03
	10-Yr	-	-	-	-	-	-	-	-	19.52	0.00	19.53	0.01	19.56	0.01
PM-3-5	Existing	20.74	0.03	20.77	0.04	20.81	0.04	20.89	0.05	21.05	0.07	21.15	0.08	21.38	0.11
	2-Yr	-	-	20.72	0.03	20.73	0.03	20.74	0.03	20.76	0.03	20.77	0.03	20.78	0.04
	3-Yr	-	-	-	-	20.73	0.03	20.74	0.03	20.75	0.03	20.76	0.03	20.77	0.04
	5-Yr	-	-	-	-	-	-	20.74	0.03	20.74	0.03	20.74	0.03	20.76	0.03
	10-Yr	-	-	-	-	-	-	-	-	20.73	0.03	20.74	0.03	20.75	0.03
PM-3-6	Existing	20.62	0.03	20.64	0.04	20.68	0.05	20.74	0.07	20.87	0.11	20.98	0.14	21.15	0.19
	2-Yr	-	-	20.50	0.00	20.51	0.00	20.52	0.00	20.53	0.01	20.54	0.01	20.55	0.02
	3-Yr	-	-	-	-	20.50	0.00	20.51	0.00	20.52	0.01	20.53	0.01	20.54	0.01
	5-Yr	-	-	-	-	-	-	20.50	0.00	20.51	0.00	20.52	0.01	20.53	0.01
	10-Yr	-	-	-	-	-	-	-	-	20.50	0.00	20.51	0.00	20.52	0.00
PM-4-1	Existing	18.21	0.18	18.26	0.23	18.32	0.28	18.44	0.39	18.57	0.53	18.63	0.61	18.74	0.76
	2-Yr	-	-	18.00	0.00	18.01	0.01	18.03	0.03	18.06	0.05	18.07	0.06	18.09	0.08
	3-Yr	-	-	-	-	18.00	0.00	18.01	0.01	18.04	0.04	18.05	0.04	18.07	0.06
	5-Yr	-	-	-	-	-	-	18.01	0.01	18.02	0.02	18.03	0.03	18.05	0.04
	10-Yr	-	-	-	-	-	-	-	-	18.00	0.00	18.01	0.01	18.03	0.03
PM-4-2	Existing	18.26	0.11	18.32	0.14	18.39	0.17	18.51	0.23	18.57	0.29	18.62	0.34	18.70	0.42
	2-Yr	-	-	18.00	0.00	18.01	0.00	18.03	0.01	18.07	0.03	18.08	0.03	18.11	0.05
	3-Yr	-	-	-	-	18.00	0.00	18.02	0.01	18.05	0.02	18.06	0.03	18.09	0.04
	5-Yr	-	-	-	-	-	-	18.00	0.00	18.02	0.01	18.02	0.03	18.06	0.03
	10-Yr	-	-	-	-	-	-	-	-	18.01	0.00	18.02	0.01	18.03	0.01
PARAÑAQUE-LAS PIÑAS															
PA-1	Existing	12.86	2.80	13.00	3.31	13.14	3.50	13.42	3.89	13.69	3.99	13.79	4.02	13.91	4.05
	2-Yr	-	-	12.17	0.55	12.20	0.58	12.23	0.62	12.28	0.69	12.31	0.73	12.37	0.80
	3-Yr	-	-	-	-	12.18	0.56	12.20	0.59	12.25	0.65	12.27	0.68	12.32	0.73
	5-Yr	-	-	-	-	-	-	12.18	0.57	12.22	0.61	12.23	0.63	12.27	0.67
	10-Yr	-	-	-	-	-	-	-	-	12.19	0.57	12.20	0.59	12.21	0.61
PA-2	Existing	12.02	0.59	12.05	0.69	12.09	0.84	12.17	1.14	12.30	1.63	12.37	1.90	12.46	2.25
	2-Yr	-	-	11.96	0.35	11.97	0.37	11.97	0.39	11.98	0.41	11.98	0.42	11.99	0.44
	3-Yr	-	-	-	-	11.96	0.35	11.97	0.38	11.98	0.40	11.98	0.41	11.98	0.42
	5-Yr	-	-	-	-	-	-	11.96	0.35	11.97	0.39	11.97	0.39	11.98	0.41
	10-Yr	-	-	-	-	-	-	-	-	11.97	0.36	11.97	0.38	11.97	0.39
PA-3	Existing	12.13	0.30	12.20	0.42	12.29	0.58	12.44	0.83	12.54	0.98	12.59	1.04	12.65	1.13
	2-Yr	-	-	11.96	0.00	11.96	0.01	11.97	0.01	11.98	0.03	11.98	0.04	11.99	0.05
	3-Yr.	-	-	-	-	11.96	0.00	11.96	0.01	11.97	0.02	11.98	0.03	11.98	0.04
	5-Yr	-	-	-	-	-	-	11.96	0.00	11.97	0.01	11.97	0.02	11.98	0.03
	10-Yr	-	-	-	-	-	-	-	-	11.96	0.00	11.96	0.00	11.96	0.01
PA-4	Existing	12.06	0.62	12.11	0.74	12.18	0.94	12.30	1.26	12.49	1.68	12.55	1.69	12.63	1.70
	2-Yr	-	-	11.97	0.38	11.99	0.42	12.02	0.50	12.06	0.61	12.07	0.63	12.08	0.66
	3-Yr	-	-	-	-	11.97	0.38	11.99	0.43	12.03	0.53	12.06	0.60	12.07	0.63
	5-Yr	-	-	-	-	-	-	11.98	0.39	12.01	0.47	12.03	0.52	12.06	0.60
	10-Yr	-	-	-	-	-	-	-	-	11.99	0.41	12.00	0.45	12.02	0.50
VALENZUELA															
ME-9	Existing	12.11	2.95	12.16	3.52	12.23	4.27	12.37	5.66	12.51	7.58	12.55	8.48	12.61	9.65
	2-Yr	-	-	12.13	3.22	12.19	3.85	12.25	4.43	12.32	5.16	12.35	5.47	12.39	5.87
	3-Yr	-	-	-	-	12.19	3.85	12.25	4.43	12.32	5.16	12.35	5.47	12.39	5.87
	5-Yr	-	-	-	-	-	-	12.23	4.18	12.30	4.95	12.33	5.26	12.37	5.70
	10-Yr	-	-	-	-	-	-	-	-	12.27	4.60	12.30	4.95	12.34	5.39

表6．3－3　２０２０年土地利用下の代替案Ｂ／Ｃ比

RIVER SYSTEM	BENEFIT/COST RATIOS				
	100-YR	50-YR	30-YR	20-YR	10-YR
PASIG MARIKINA	1.32	1.38	1.38	1.35	1.28
BULI BAHO MAHABA	0.73	0.82	0.84	0.83	0.78
MALABON TULLAHAN	0.73	0.88	0.98	1.04	1.14
S.PARANAQUE LAS PINAS	0.98	1.07	1.13	1.16	1.19

DRAINAGE AREA	BENEFIT/COST RATIOS			
	10-YR	5-YR	3-YR	2-YR
MANILA	1.17	---	---	---
MALABON NAVOTAS	2.40	2.49	2.50	2.29
EAST OF MANGAHAN	1.77	1.89	1.94	1.88
WEST OF MANGAHAN	1.97	2.19	2.38	2.57
SAN JUAN	0.81	0.83	0.79	0.69
MANDALUYONG PASIG	1.36	1.42	1.45	1.65
MARIKINA	1.40	1.52	1.61	1.69
PARANAQUE LAS PINAS	0.97	1.08	1.23	1.37
VALENZUELA	1.59	1.61	1.39	0.98

表6．4—1　プロジェクトの規模と投資コスト

RIVER SYSTEM / DRAINAGE AREA	CASE 1		CASE 2		CASE 3		CASE 4		CASE 5		CASE 6	
	PROJECT SCALE	INVEST. (MIL.P)	PROJECT SCALE	INVEST. (MIL.P)	PROJECT SCALE	INVEST. (MIL.P)	PROJECT SCALE	INVEST. (MIL.P)	PROJECT SCALE	INVEST. (MIL.P)	PROJECT SCALE	INVEST. (MIL.P)
1. PASIG-MARIKINA RIVER	100-Yr.	4,413	100-Yr.	4,413	30-Yr.	3,774	30-Yr.	3,774	100-Yr.	4,413	30-Yr.	3,774
2. BAHO BULI MAHABA RIVERS	50-Yr.	1,652	30-Yr.	1,542	30-Yr.	1,542	20-Yr.	1,494	---		---	
3. MALABON-TULLAHAN RIVER	50-Yr.	759	30-Yr.	655	30-Yr.	655	20-Yr.	589	---		---	
4. S. PARANAQUE L. PINAS RIVERS	50-Yr.	869	30-Yr.	780	30-Yr.	780	20-Yr.	715	---		---	
SUB-TOTAL		7,693		7,390		6,751		6,572		4,413		3,774
1. MANILA	10-Yr.	2,431	---		---		---		10-Yr.	2,431	---	
2. MALABON NAVOTAS	10-Yr.	1,294	5-Yr.	1,151	5-Yr.	1,151	3-Yr.	1,004	10-Yr.	1,294	5-Yr.	1,151
3. EAST OF MANGAHAN	10-Yr.	286	5-Yr.	249	5-Yr.	249	3-Yr.	218	10-Yr.	286	5-Yr.	249
4. WEST OF MANGAHAN	10-Yr.	2,327	5-Yr.	2,076	5-Yr.	2,076	3-Yr.	1,893	10-Yr.	2,327	5-Yr.	2,076
5. SAN JUAN	5-Yr.	1,066	3-Yr.	962	3-Yr.	962	2-Yr.	867	---		---	
6. MANDALUYONG PASIG	5-Yr.	790	3-Yr.	721	3-Yr.	721	2-Yr.	579	---		---	
7. MARIKINA	5-Yr.	200	3-Yr.	184	3-Yr.	184	2-Yr.	168	---		---	
8. PARANAQUE LASPINAS	5-Yr.	658	3-Yr.	573	3-Yr.	573	2-Yr.	504	---		---	
9. VALENZUELA	5-Yr.	265	3-Yr.	217	3-Yr.	217	2-Yr.	211	---		---	
SUB-TOTAL		9,316		6,133		6,133		5,443		6,338		3,476
TOTAL INVESTMENT		17,009		13,523		12,884		12,015		10,751		7,250

表６．４－２　提案した委員会の構成

	Composition	Present Related Responsibility	Position in Committee	Proposed Responsibility for the Committee
1.	Secretary of DPWH	Supervision of all flood control projects nationwide.	Chairman	Management, presiding and coordinating for the committee.
2.	Director-General of NEDA	Allocation of funds for flood control and drainage projects nationwide.	Member	Coordination on the fund allocation of the proposed projects and other projects.
3.	Governor of MMC	Supervision of all public service activities in Metro Manila.	-ditto-	Coordination of the proposed projects and other public affairs in Metro Manila.
4.	Undersecretary for Planning, DPWH	Supervision of the Planning Service, the Bureau of Design, and the Bureua of Research and Standards, DPWH.	-ditto-	Coordination of the proposed projects and other plans administered by DPWH.
5.	General Manager of LLDA	Identification of development programs of Laguna Lake and adjoining areas.	-ditto-	Coordination of the proposed projects and other programs in Laguna Lake and adjoining areas.
6.	President of Metro Manila Mayor's League	Supervision of public service activities in respective cities or municipalities.	-ditto-	Coordination of the proposed projects and other public affairs in the cities and municipalities concerned.

表６．４－３　提案した技術検討委員会(TWG)の構成

	Composition	Present Related Responsibility	Position in Committee	Proposed Responsibility for TWG
1.	Undersecretary for Planning, DPWH	Supervision of the Planning Service, the Bureau of Design, and the Bureau of Research and Standards, DPWH.	Chairman	Management, presiding and coordination for TWG.
2.	Regional Director of DPWH-NCR	Management of DPWH-NCR and supervision of all flood control projects in Metro Manila.	Member	Coordination of the proposed projects and other programs administered by DPWH-NCR and other related regional programs under DPWH.
3.	Project Director of PMO, DPWH	Implementation of major flood control and drainage projects in Metro Manila.	-ditto-	Coordination of the proposed projects and other related programs under PMOs under DPWH.
4.	Representative of NEDA	Allocation of funds for flood control and drainage projects.	-ditto-	Coordination on the fund allocation of the proposed projects and other programs.
5.	Representative OF LLDA	Identification of development progams of Laguna Lake and adjoining areas.	-ditto-	Coordination of the proposed projects and other programs in Laguna Lake and adjoining areas.
6.	Representative of PAGASA	Meteorological information services and flood forecasting activities.	-ditto-	Coordination and cooperation on flood forecasting.
7.	Representative of OCD	Information center on flood defense and flood disaster.	-ditto-	Cooperation on flood forecasting and flood defense.
8.	Representative of MMC	Cleaning of waterways to facilitate drainage, and minor drainage programs as a part of road maintenace projects.	-ditto-	Coordination of the proposed projects and other public affairs in Metro Manila.
9.	President of Metro Manila Mayor's League*	Supervision of public service activities in respective cities or municipalities.	-ditto-	Coordination of the proposed projects and other public affairs in the cities and municipalities concerned.

* On call, case to case basis.

表6．4－4　提案した実施機関の責務

Items	DPWH NCR	DPWH PMOs	Local /3 Governments
I. Planning and Design	0	0	
II. Construction	0	0	
III. Operation /1	0		
IV. Maintenance /1			
1. River	0		
2. Drainage Facilities			
(a) Estereo	0		
(b) Drainage Main/Outfall	0		
(c) Drainage Lateral /2			
- Major	0		
- Minor			0
(d) Street Gutter /2			
- Major	0		
- Minor			0

[Note]

/1: Operation and Maintenance of pumping stations, floodgates, etc., are included.

/2: Drainage laterals and street gutters are classified into two: major facilities and minor facilities. Major facilities are those connected to national level structures and/or national roads and minor facilities are those connected to local government level structures and/or secondary/tertiary roads.

/3: Local governments mean MMC and city/municipality.

O: This mark shows the execution of each item of responsibility.

表6．4—5　工種別単価

Item	Unit	Unit Cost(Peso) (A) Total	(A) F.C.	(A) L.C.	(B) Total	(B) F.C.	(B) L.C.	(C) Total	(C) F.C.	(C) L.C.	Remarks
1 Main Civil Works											
Excavation	cu.m										
Excavation,common	cu.m	50	43	7	30	26	4	30	26	4	
Excavation,pump dredger	cu.m	170	145	25	140	119	21	50	43	7	
Excavation,clamshell	cu.m	200	170	30	160	136	24	70	60	10	
Backfill	cu.m	30	26	4	30	26	4	30	26	4	
Embankment	cu.m	40	34	6	40	34	6	40	34	6	
Rip-rap	sq.m	100	50	50	100	50	50	100	50	50	
Revetment,rubble concrete	sq.m	600	450	150	600	450	150	600	450	150	
Mass concrete	cu.m	1,500	1,125	375	1,500	1,125	375	1,500	1,125	375	
Parapet wall,R.C.	cu.m	3,000	2,100	900	3,000	2,100	900	3,000	2,100	900	
River wall,rubble concrete	cu.m	1,200	660	540	1,200	660	540	1,200	660	540	
River wall,reinforced con.	cu.m	4,000	2,800	1,200	4,000	2,800	1,200	4,000	2,800	1,200	
River wall,steel sheet pile	sq.m	3,500	3,325	175	3,500	3,325	175	3,500	3,325	175	
Bridge(inc.demolition)	sq.m	8,000	6,000	2,000	8,000	6,000	2,000	8,000	6,000	2,000	
Sub total											
Preparatory works & mis. *1)											1);20-80% of sub-total
Total											
2 E/S & admi. *2)											2);20% of main civil works
3 Contingency *3)											3);10% of (1+2)
4 Land acquisition											
Congested area 1 *4)	sq.m	3,000			3,000			3,000			4);Manila,Quezon,Makati & Pasay city aeras
Congested area 2 *5)	sq.m	1,200			1,200			1,200			5);except above-mentioned 4)areas
Open space *6)	sq.m	300			300			300			6);other than residence area

Notes:
* Unit costs(A) are applied in the congested areas along the Pasig R.& Esteros.
* Unit costs(C) are applied in the areas of the vicinities of river mouths and with available spaces for spoil banks.
* Unit costs(B) are applied for areas other than the above-mentioned areas where unit costs (A)or(C) applied.
* Preparatory works & mis. costs are varied in accordance with revetment works & water depth.
  - 80% : water depth of 5m<H
  - 50% : water depth of 3m<H<5m
  - 30% : water depth of H<3m
  - 20% : others

表6．4－6(1/4) 提案プロジェクトの建設費

PASIG-MARIKINA RIVER IMPROVEMENT (100-Yr)

River	Stretch	Length (M)	Design Discharge (m3/s)	Required Works							Construction Cost		
				Exca. (1000m3)	Embank. (1000m3)	Revet. (1000m2)	Concrete (1000m3)	Gate (ton)	Re.Bridge (place)	Land Acq. (1000m2)	Civil Works (mil.Peso)	L.A./Compen. (mil.Peso)	Total (mil.Peso)
River Mouth/San Juan C.	Sta. 0+000/ 8+735	8,735	1150	2,334	0	40	3	0	1	20	646	60	706
San Juan C./Napindan C.	Sta. 8+735/18+495	9,760	500	300	0	60	10	0	0	15	212	45	257
Napindan C./M.C.G.S.	Sta.18+495/ 5+425	5,680	500	100	10	10	1	0	0	8	39	24	63
M.C.G.S. /Mangahan C.	Sta. 5+425/ 6+635	1,210	500	100	5	2	1	0	0	15	24	18	42
Mangahan C./Sta.7+425	Sta. 6+635/ 7+425	790	2900	50	5	2	2	0	0	10	26	12	38
M.C.G.S.			500	30	6	0	22	300	0	1	183	1	184
San Juan River	Sta. 0+000/10+653	10,653	900	1,820	0	175	43	0	4	50	580	177	757
	Sub-Total	36,728		4,734	26	289	82	300	5	119	1,710	337	2,047
Mangahan C./Nangka C.	Sta. 7+425/18+620	11,195	2900	2,493	555	109	46	0	0	950	497	334	831
Nangka C. /Rodorigez B.	Sta.18+620/27+200	8,580	2600	1,596	692	0	0	0	0	1,753	218	517	735
Marikina Dam (Qcut=600m3/s)			2100	40	0	0	120	0	0	2,500	675	125	800
	Sub-Total	19,775		4,129	1,246	109	166	0	0	5,203	1,390	976	2,366
	Total	56,503		8,863	1,272	398	248	300	5	5,322	3,100	1,313	4,413

表6．4－6(2/4) 提案プロジェクトの建設費

BAHO BULI MAHABA RIVER IMPROVEMENT (30-Yr)

River	Stretch	Length (M)	Design Discharge (m3/s)	Required Works							Construction Cost		
				Exca. (1000m3)	Embank. (1000m3)	Revet. (1000m2)	Concrete (1000m3)	Gate (ton)	Re.Bridge (place)	Land Acq. (1000m2)	Civil Works (mil.Peso)	L.A./Compen. (mil.Peso)	Total (mil.Peso)
Mahaba River	Sta. 0+000/ 5+000	5,000	160	390	35	0	0	0	6	173	64	130	194
	Sta. 5+000/ 6+000	1,000	160	10	0	0	0	0	0	3	1	3	4
	Sub-Total	6,000		400	35	0	0	0	6	176	65	133	198
Baho River	Sta. 0+000/ 5+500	5,500	275	560	30	0	0	0	7	172	92	120	212
	Sta.A0+000/A2+000	2,000	230	190	3	0	0	0	3	52	29	16	45
	Sta.A2+000/A3+000	1,000	230	40	0	0	0	0	0	9	4	3	7
	Sub-Total	8,500		790	33	0	0	0	10	233	125	139	264
Buli River	Sta. 0+000/6A+200	3,100	270	240	36	0	0	0	4	81	67	71	138
	Sta.6A+200/8A+200	2,000	230	250	5	0	0	0	3	60	37	18	55
	Sta.8A+200/9A+830	1,630	230	170	13	0	0	0	1	61	32	18	51
	Sta.9A+830/10+480	650	230	70	6	0	0	0	1	26	12	31	43
	Sta.10+480/14+000	2,520	180	260	16	0	0	0	3	93	46	111	158
	Sta.14+000/15+000	1,000	180	60	0	0	0	0	1	16	18	19	36
	Sub-Total	10,900		1,050	76	0	0	0	13	337	212	269	480
Tributary-B	Sta. 0+000/ 5+000	5,000	95	340	11	0	0	0	3	118	57	35	92
	Sta. 5+000/ 6+000	1,000	95	20	2	0	0	0	2	12	5	3	9
	Sub-Total	6,000		360	13	0	0	0	5	130	62	39	101
Tributary-C	Sta. 0+000/ 4+000	4,000	50	140	3	0	0	0	3	49	25	43	67
	Sta. 4+000/ 5+000	1,000	50	150	0	0	0	0	0	5	1	2	3
	Sub-Total	5,000		290	3	0	0	0	3	54	26	45	71
Mangahan Diversion	Sta. 6+800/ 6+100	700	470	870	15	0	0	0	0	180	131	53	184
	Sta. 6+100/ 4+500	1,600	435	840	0	0	0	0	0	140	128	42	170
	Sta. 4+500/ 3+000	1,500	280	410	24	0	0	0	0	93	47	28	75
	Sub-Total	3,800		2,120	39	0	0	0	0	413	306	123	429
	Total	40,200		5,010	199	0	0	0	37	1,343	796	747	1,542

表6．4－6(3/4) 提案プロジェクトの建設費

MALABON-TULLAHAN RIVER IMPROVEMENT (30-Yr)

River	Stretch	Length (M)	Design Discharge (m3/s)	Required Works: Exca. (1000m3)	Embank. (1000m3)	Revet. (1000m2)	Concrete (1000m3)	Gate (ton)	Re.Bridge (place)	Land Acq. (1000m2)	Construction Cost: Civil Works (mil.Peso)	L.A./Compen. (mil.Peso)	Total (mil.Peso)
Malabon River	Sta. 0+000/ 2+835	2,835	500	970	112	68	0	0	3	64	122	77	199
	Sta. 2+835/ 4+377	1,542	480	170	55	20	0	0	0	33	37	40	77
	Sta. 4+377/ 5+427	1,050	450	70	82	10	0	0	3	13	40	16	56
	Sub-Total	5,427		1,210	250	98	0	0	6	110	199	133	332
Tullahan River	Sta. 0+000/ 4+800	4,800	420	400	141	0	0	0	0	80	163	96	259
	Sta. 4+800/18+000	13,200	290	20	0	0	0	0	0	19	23	23	46
	Sta.18+000/20+500	2,500	210	10	21	0	0	0	0	5	8	6	14
	Sta.20+500/21+500	1,000	210	10	0	0	0	0	0	1	3	1	4
	Sub-Total	21,500		440	163	0	0	0	0	105	197	126	323
	Total	26,927		1,650	413	98	0	0	6	215	397	259	655

SOUTH PARANAQUE LAS PINAS RIVER IMPROVEMENT (30-Yr)

River	Stretch	Length (M)	Design Discharge (m3/s)	Required Works: Exca. (1000m3)	Embank. (1000m3)	Revet. (1000m2)	Concrete (1000m3)	Gate (ton)	Re.Bridge (place)	Land Acq. (1000m2)	Construction Cost: Civil Works (mil.Peso)	L.A./Compen. (mil.Peso)	Total (mil.Peso)
Las Pinas River	Sta. 0+000/ 1+780	1,780	210	181	80	3	0	0	2	21	111	25	136
	Sta. 1+780/ 6+395	4,615	180	498	94	20	0	0	2	86	149	104	253
	Sta. 6+395/ 7+395	1,000	110	30	0	5	0	0	0	3	11	4	15
	Sub-Total	7,395		710	173	28	0	0	4	110	271	133	404
South Paranaque River	Sta. 0+000/ 0+560	560	520	76	10	3	0	0	0	4	21	5	26
	Sta.D0+000/D0+400	400	520	76	19	0	0	0	0	2	51	2	53
	Sta.D0+400/S0+000	400	350	91	14	0	0	0	0	9	10	11	21
	Sta.S0+000/S1+200	1,200	350	242	68	0	0	0	0	37	20	44	65
	Sta.S1+200/S2+600	1,400	300	272	31	0	0	0	0	46	32	55	88
	Sta.S2+600/S3+600	1,000	300	91	2	0	0	0	0	16	3	19	23
	Sub-Total	4,960		846	144	3	0	0	0	114	138	137	275
Dongalo River	Sta. 0+000/ 2+600	2,600	170	211	38	13	0	0	0	24	54	29	83
	Sta. 2+600/ 3+600	1,000	170	30	1	5	0	0	0	6	11	7	18
	Sub-Total	3,600		242	39	18	0	0	0	30	65	36	101
	Total	15,955		1,797	357	49	0	0	4	254	475	305	780

表6．4－6(4/4) 提案プロジェクトの建設費

DRAINAGE IMPROVEMENT

Drainage Area	Area	Required Works												Construction Cost		
		Pump Station		Gate		Channel Impvt.	Open Cha. Const.	Closed Cha. Const.	Ring Dike/ Lake Dike	Regulating Pond		Reconst. Bridge	Land Acq.	Civil Works	L.A./Compen.	Total
	(km2)	(site)	(m3/s)	(site)	(ton)	(m)	(m)	(m)	(m)	(site)	(1000m3)	(place)	(1000m2)	(mil.Peso)	(mil.Peso)	(mil.Peso)
Project Scale (5-Yr)																
Malabon-Navotas	24.9	8	62.1	16	405	5,100	5,600	800	22,000	0	0	11	106	1,108	43	1,151
East of Mangahan	8.8	4	27.0	4	84	1,100	7,300	0	1,800	2	51	2	62	211	38	249
West of Mangahan	38.1	5	129.3	10	342	34,100	11,000	1,450	8,900	4	642	26	237	1,910	166	2,076
Sub-Total	71.8	17	218.4	30	831	40,300	23,900	2,250	32,700	6	693	39	405	3,229	247	3,476
Project Scale (3-Yr)																
San Juan	12.7	9	31.0	13	103	1,300	0	12,300	3,400	0	0	8	6	960	2	962
Mandaluyong Pasig	15.9	3	14.5	3	40	2,500	0	8,800	0	0	0	5	8	713	8	721
Marikina	13.0	0	0.0	1	7	0	1,000	2,600	0	0	0	2	20	169	15	184
Paranaque Laspinas	15.4	2	12.5	8	175	4,800	650	0	0	0	0	3	36	559	14	573
Valenzuela	18.4	0	0.0	1	10	12,900	500	0	8,000	0	0	4	29	205	12	217
Sub-Total	75.4	14	58.0	26	335	21,500	2,150	23,700	11,400	0	0	22	99	2,606	51	2,657
Total	147.2	31	276.4	56	1,166	61,800	26,050	25,950	44,100	6	693	61	504	5,835	298	6,133

表6．4－7　年間・維持・管理及び付替経費

UNIT : MIL. PESO

RIVER IMPROVEMENT SCHEME	OPERATION, MAINTENANCE AND REPLACEMENT COST	PROJECT SCALE
1. PASIG RIVER	7.6	100-Yr
2. MARIKINA RIVER	3.2	100-Yr
3. BAHO BULI MAHABA RIVERS	2.1	30-Yr
4. MALABON TULLAHAN RIVERS	1.1	30-Yr
5. SOUTH PARANAQUE LAS PINAS RIVERS	1.5	30-Yr
TOTAL	15.5	

UNIT : MIL. PESO

DRAINAGE IMPROVEMENT SCHEME	OPERATION, MAINTENANCE AND REPLACEMENT COST	PROJECT SCALE
1. MALABON NAVOTAS	9.7	5-Yr
2. EAST OF MANGAHAN	3.1	5-Yr
3. WEST OF MANGAHAN	36.0	5-Yr
4. MALABON NAVOTAS (REMAINING)	1.7	5-Yr
5. SAN JUAN	7.5	3-Yr
6. MANDALUYONG PASIG	3.7	3-Yr
7. MARIKINA	3.4	3-Yr
8. PARANAQUE LAS PINAS	3.4	3-Yr
9. VALENZUELA	0.7	3-Yr
TOTAL	69.2	

表６．４－８(1/2) 各流域の資産平均単価（土地利用条件２０２０年）

UNIT: million peso

SUB-BASIN	TOTAL AREA* (km2)	HOUSE/BUILDING** TOTAL	HOUSE/BUILDING** PER km2	HOUSE/BUILDING*** TOTAL	HOUSE/BUILDING*** PER km2	INDUSTRIAL INDOOR MOVABLES TOTAL	INDUSTRIAL INDOOR MOVABLES PER km2
(MEYCAUAYAN)							
ME- 1	2.38	1,979.20	831.60	1,979.20	831.60	0.00	0.00
ME- 2	10.13	4,799.20	473.76	4,787.20	472.58	73.50	7.26
ME- 3	21.55	18,469.60	857.06	18,293.60	848.89	1,078.00	50.02
ME- 4	22.54	4,407.20	195.53	4,203.20	186.48	1,249.50	55.43
ME- 5	8.59	3,103.60	361.30	2,745.60	319.63	2,192.75	255.27
ME- 6	21.76	9,625.60	442.35	9,313.60	428.01	1,911.00	87.82
ME- 7	8.82	4,317.60	489.52	3,761.60	426.49	3,405.50	386.11
ME- 8	17.81	9,106.00	511.29	7,568.00	424.93	9,420.25	528.93
ME- 9	18.42	10,165.60	551.88	10,139.60	550.47	159.25	8.65
SUB-TOTAL	132.00	65,973.60	499.80	62,791.60	475.69	19,489.75	147.65
(MALABON-TULLAHAN)							
MT- 1	0.26	208.00	800.00	208.00	800.00	0.00	0.00
MT- 2	13.38	13,878.40	1,037.25	13,878.40	1,037.25	0.00	0.00
MT- 3	20.08	11,827.60	589.02	10,857.60	540.72	5,941.25	295.88
MT- 4	9.97	4,942.00	495.69	4,514.00	452.76	2,621.50	262.94
SUB-TOTAL	43.69	30,856.00	706.25	29,458.00	674.25	8,562.75	195.99
(PASIG/MARIKINA)							
PM- 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PM- 2	13.46	7,361.20	546.89	7,291.20	541.69	428.75	31.85
PM- 3	47.26	38,426.00	813.08	37,752.00	798.82	4,128.25	87.35
PM- 4	6.18	4,578.00	740.78	4,182.00	676.70	2,425.50	392.48
PM- 5	11.33	7,639.60	674.28	7,059.60	623.09	3,552.50	313.55
PM- 6	8.74	4,086.80	467.60	3,690.80	422.29	2,425.50	277.52
PM- 7	4.58	3,088.80	674.41	2,916.80	636.86	1,053.50	230.02
SUB-TOTAL	91.55	65,180.40	711.97	62,892.40	686.97	14,014.00	153.07
(SAN JUAN)							
SJ- 1	23.27	19,578.40	841.36	19,536.40	839.55	257.25	11.06
SJ- 2	10.53	6,432.00	610.83	6,018.00	571.51	2,535.75	240.81
SJ- 3	2.18	1,128.00	517.43	942.00	432.11	1,139.25	522.59
SJ- 4	9.96	5,462.00	548.39	5,348.00	536.95	698.25	70.11
SJ- 5	8.24	4,164.80	505.44	3,480.80	422.43	4,189.50	508.43
SJ- 6	14.02	8,010.40	571.36	7,962.40	567.93	294.00	20.97
SJ- 7	3.55	2,644.00	744.79	2,644.00	744.79	0.00	0.00
SJ- 8	12.07	7,559.20	626.28	7,559.20	626.28	0.00	0.00
SJ- 9	6.53	4,367.20	668.79	4,255.20	651.64	686.00	105.05
SJ- 10	1.09	638.00	585.32	580.00	532.11	355.25	325.92
SUB-TOTAL	91.44	59,984.00	655.99	58,326.00	637.86	10,155.25	111.06
(BAHO/BULI)							
BB- 1	16.55	15,317.20	925.51	15,085.20	911.49	1,421.00	85.86
BB- 2	6.63	6,955.20	1,049.05	6,955.20	1,049.05	0.00	0.00
BB- 3	5.55	2,492.40	449.08	2,184.40	393.59	1,886.50	339.91
BB- 4	25.76	25,684.80	997.08	25,684.80	997.08	0.00	0.00
BB- 5	4.21	2,962.40	703.66	2,878.40	683.71	514.50	122.21
BB- 6	4.46	4,774.40	1,070.49	4,726.40	1,059.73	294.00	65.92
BB- 7	9.18	7,518.00	818.95	7,024.00	765.14	3,025.75	329.60
SUB-TOTAL	72.34	65,704.40	908.27	64,538.40	892.15	7,141.75	98.72
(SOUTH PARANAQUE/LAS PINAS)							
PL- 1	11.49	9,549.60	831.12	9,273.60	807.10	1,690.50	147.13
PL- 2	3.44	3,270.40	950.70	3,270.40	950.70	0.00	0.00
PL- 3	19.25	18,986.40	986.31	18,730.40	973.01	1,568.00	81.45
PL- 4	6.24	6,012.40	963.53	5,806.40	930.51	1,261.75	202.20
PL- 5	9.72	10,886.40	1,120.00	10,886.40	1,120.00	0.00	0.00
ZP- 1	6.77	3,203.20	473.15	3,203.20	473.15	0.00	0.00
ZP- 2	3.67	3,897.60	1,062.02	3,897.60	1,062.02	0.00	0.00
ZP- 3	4.76	1,097.60	230.59	1,097.60	230.59	0.00	0.00
SUB-TOTAL	65.34	56,903.60	870.88	56,165.60	859.59	4,520.25	69.18

NOTE *: Excluding the area of forest.
**: For the calculation of damage on immovables (res./com. and industrial).
***: For the calculation of damage on movables (residential/commercial).
The location of subbasins is presented in Fig. 3.1-1.

表６．４－８(2/2) 各流域の資産平均単価（土地利用条件２０２０年）

UNIT: million peso

SUB-BASIN	TOTAL AREA* (km2)	HOUSE/BUILDING** TOTAL	HOUSE/BUILDING** PER km2	HOUSE/BUILDING*** TOTAL	HOUSE/BUILDING*** PER km2	INDUSTRIAL INDOOR MOVABLES TOTAL	INDUSTRIAL INDOOR MOVABLES PER km2
(MALABON NAVOTAS)							
MA- 1	2.26	1,592.00	704.42	1,456.00	644.25	833.00	368.58
MA- 2	2.05	1,207.20	588.88	1,207.20	588.88	0.00	0.00
MA- 3	2.21	1,598.40	723.26	1,598.40	723.26	0.00	0.00
MA- 4	0.50	381.60	763.20	369.60	739.20	73.50	147.00
MA- 5	1.89	1,306.00	691.01	1,272.00	673.02	208.25	110.19
MA- 6	1.34	1,036.00	773.13	1,036.00	773.13	0.00	0.00
MA- 7	2.40	1,692.00	705.00	1,688.00	703.33	24.50	10.21
MA- 8	3.76	2,974.00	790.96	2,974.00	790.96	0.00	0.00
MA- 9	0.30	88.00	293.33	42.00	140.00	281.75	939.17
MA- 10	0.91	426.00	468.13	342.00	375.82	514.50	565.38
MA- 11	0.69	192.00	278.26	72.00	104.35	735.00	1,065.22
MA- 12	0.32	64.00	200.00	0.00	0.00	392.00	1,225.00
SUB-TOTAL	18.63	12,557.20	674.03	12,057.20	647.19	3,062.50	164.39
(MANILA AND SUBURBS, NORTH)							
NM- 1	16.79	7,968.00	474.57	7,790.00	463.97	1,090.25	64.93
NM- 2	0.36	104.00	288.89	54.00	150.00	306.25	850.69
NM- 3	9.06	4,556.00	502.87	4,344.00	479.47	1,298.50	143.32
NM- 4	0.69	278.00	402.90	210.00	304.35	416.50	603.62
NM- 5	1.68	414.00	246.43	126.00	75.00	1,764.00	1,050.00
SUB-TOTAL	28.58	13,320.00	466.06	12,524.00	438.21	4,875.50	170.59
(MANILA AND SUBURBS, SOUTH)							
SM- 1	5.99	4,843.20	808.55	4,811.20	803.21	196.00	32.72
SM- 2	7.06	3,180.00	450.42	2,846.00	403.12	2,045.75	289.77
SM- 3	1.41	98.00	69.50	0.00	0.00	600.25	425.71
SM- 4	3.88	1,412.00	363.92	1,344.00	346.39	416.50	107.35
SM- 5	24.80	11,301.60	455.71	10,999.60	443.53	1,849.75	74.59
SUB-TOTAL	43.14	20,834.80	482.96	20,000.80	463.63	5,108.25	118.41
(EAST OF MANGAHAN)							
EM- 1	1.67	1,816.00	1,087.43	1,816.00	1,087.43	0.00	0.00
EM- 2	2.42	812.80	335.87	682.80	282.15	796.25	329.03
EM- 3	2.72	914.80	336.32	884.80	325.29	183.75	67.56
EM- 4	1.95	958.80	491.69	958.80	491.69	0.00	0.00
SUB-TOTAL	8.76	4,502.40	513.97	4,342.40	495.71	980.00	111.87
(WEST OF MANGAHAN)							
WM- 1	9.12	5,140.00	563.60	4,764.00	522.37	2,303.00	252.52
WM- 2	5.14	3,669.60	713.93	3,505.60	682.02	1,004.50	195.43
WM- 3	6.83	5,494.00	804.39	5,170.00	756.95	1,984.50	290.56
WM- 4	14.28	9,710.80	680.03	9,642.80	675.27	416.50	29.17
WM- 5	2.77	3,102.40	1,120.00	3,102.40	1,120.00	0.00	0.00
SUB-TOTAL	38.14	27,116.80	710.98	26,184.80	686.54	5,708.50	149.67
(PARANAQUE LAS PINAS)							
PA- 1	8.82	2,254.00	255.56	2,254.00	255.56	0.00	0.00
PA- 2	2.41	1,690.80	701.58	1,690.80	701.58	0.00	0.00
PA- 3	1.55	1,087.60	701.68	1,087.60	701.68	0.00	0.00
PA- 4	2.65	2,412.80	910.49	2,412.80	910.49	0.00	0.00
SUB-TOTAL	15.43	7,445.20	482.51	7,445.20	482.51	0.00	0.00

NOTE *: Excluding the area of forest.
**: For the calculation of damage on immovables (res./com. and industrial).
***: For the calculation of damage on movables (residential/commercial).
The location of subbasins is presented in Fig. 3.1-1.

表6．4－9　マスタープランの年平均便益の詳細

RIVER SYSTEM/ DRAINAGE AREA	PROJECT SCALE IN FLOOD RETURN PERIOD							
	100-YR	50-YR	30-YR	20-YR	10-YR	5-YR	3-YR	2-YR
1. River System								
Pasig Marikina	797 *	769	712	648	515	---	---	---
Baho Buli Mahaba	188	184	177 *	169	151	---	---	---
Malabon Tullahan	93	91	88 *	83	75	---	---	---
S.Paranaque Las Pinas	131	127	121 *	114	100	---	---	---
Sub-total	1,209	1,171	1,098	1,014	841	---	---	---
2. Drainage Area								
Manila	---	---	---	---	402	---	---	---
Malabon Navotas	---	---	---	---	444	409 *	358	286
East of Mangahan	---	---	---	---	73	70 *	61	52
West of Mangahan	---	---	---	---	679	675 *	666	653
San Juan	---	---	---	---	137	125	107 *	84
Mandaluyong Pasig	---	---	---	---	167	161	150 *	137
Marikina	---	---	---	---	46	46	45 *	43
Paranaque Las Pinas	---	---	---	---	101	100	99 *	96
Valenzuela	---	---	---	---	73	59	42 *	28
Sub-total	---	---	---	---	2,122	1,645	1,528	1,379

NOTE *: Annual average benefit of the Master Plan; 2,780 million peso in total.

表6．4—10　マスタープランのキャシュフロー

Unit : Million Peso

NO.	YEAR	ECONOMIC COST				ANNUAL AVERAGE BENEFIT	ANNUAL CASH FLOW
		CONSTRUC-TION	LAND ACQUISITION	OMR	TOTAL		
1	1991	379	117		495		(495)
2	1992	379	117		495		(495)
3	1993	379	117		495		(495)
4	1994	379	117		495		(495)
5	1995	379			379		(379)
6	1996	379		27	406	651	245
7	1997	379		27	406	651	245
8	1998	379		27	406	651	245
9	1999	379		27	406	651	245
10	2000	379		27	406	651	245
11	2001	308	223	54	584	1,302	718
12	2002	308	223	54	584	1,302	718
13	2003	308	223	54	584	1,302	718
14	2004	308	223	54	584	1,302	718
15	2005	308		54	362	1,302	941
16	2006	308		54	362	1,302	941
17	2007	308		54	362	1,302	941
18	2008	308		54	362	1,302	941
19	2009	308		54	362	1,302	941
20	2010	308		54	362	1,302	941
21	2011	258	418	77	753	2,057	1,304
22	2012	258	418	77	753	2,057	1,304
23	2013	258	418	77	753	2,057	1,304
24	2014	258	418	77	753	2,057	1,304
25	2015	258		77	335	2,057	1,722
26	2016	258		77	335	2,057	1,722
27	2017	258		77	335	2,057	1,722
28	2018	258		77	335	2,057	1,722
29	2019	258		77	335	2,057	1,722
30	2020	258		77	335	2,057	1,722
31	2021			85	85	2,778	2,694
32	2022			85	85	2,778	2,694
33	2023			85	85	2,778	2,694
34	2024			85	85	2,778	2,694
35	2025			85	85	2,778	2,694
36	2026			85	85	2,778	2,694
37	2027			85	85	2,778	2,694
38	2028			85	85	2,778	2,694
39	2029			85	85	2,778	2,694
40	2030			85	85	2,778	2,694
41	2031			85	85	2,778	2,694
42	2032			85	85	2,778	2,694
43	2033			85	85	2,778	2,694
44	2034			85	85	2,778	2,694
45	2035			85	85	2,778	2,694
46	2036			85	85	2,778	2,694
47	2037			85	85	2,778	2,694
48	2038			85	85	2,778	2,694
49	2039			85	85	2,778	2,694
50	2040			85	85	2,778	2,694
51	2041			85	85	2,778	2,694
52	2042			85	85	2,778	2,694
53	2043			85	85	2,778	2,694
54	2044			85	85	2,778	2,694
55	2045			85	85	2,778	2,694
56	2046			85	85	2,778	2,694
57	2047			85	85	2,778	2,694
58	2048			85	85	2,778	2,694
59	2049			85	85	2,778	2,694
60	2050			85	85	2,778	2,694

IRR =	17.26%
B/C =	1.18
NPV =	537.50

NOTE: Assumptions for the cost-benefit flow are
- Annual distribution of construction cost is equal in each phase;
- Land acquisition is made in the first four years in each phase;
- 50% of the first phase OMR cost and benefit accrues from the 6th year.

表6．4－11　洪水防御事業による環境への影響評価結果

Checklist Item	Pasig-Marikina River Improvement	Pasig-Marikina MCGS	Pasig-Marikina Marikina Dam	Malabon-Tullahan	Baho, Bull Mahaba	S. Parañaque -Las Piñas
A) Problems Due to Location						
1. Resettlement/Evacuation	0	0	-/A	-/B	-/B	-/B
2. Land value changes	+/A	+/A	+/A	+/A	+/A	+/A
3. Encroachment of precious ecology	0	0	0	0	0	0
4. Encroachment of historical/cultural values	0	0	0	0	0	0
5. Watershed erosion and silt runoff	0	0	+/A	0	0	0
6. Navigation	+/C	-/B	0	+/C	+/C	+/C
7. Effects on groundwater hydrology	0	0	±	0	0	0
8. Migrating valuable fish species	0	0	0	0	0	0
9. Inundation of land and mineral resources	0	0	-/C	0	0	0
B) Problems Related to Design						
1. Road erosion	+/A	0	0	+/A	+/A	+/A
2. Water right conflicts	0	0	0	0	0	0
3. Loss of community/ recreation areas	0	0	-/C	0	0	0
4. Intensification of traffic congestion	0	0	0	0	0	0
5. Aesthetics and landscape	+/A	+/B	+/A	+/A	+/A	+/A
6. Prevention of access	0	0	0	0	0	0
C) Problems in Construction Stage						
1. Soil erosion and silt runoff	-/C	-/B	-/B	-/C	-/C	-/C
2. Hazards to workers and nearby residents	0	0	0	0	0	0
3. Spread of communicable diseases	0	0	0	0	0	0
D) Problems in Operation Stage						
1. Water Quality	+/C	±	0	+/C	+/C	+/C
2. Eutrophication	0	0	0	0	0	0
3. Encroachment of precious ecology	0	0	0	0	0	0
4. Depreciation of fisheries	0	0	0	0	0	0
5. Vector disease hazards	0	0	0	0	0	0
6. Downstream erosion/ aggradation	0	0	0	0	0	0
7. Aesthetics and landscape	0	0	0	0	0	0

NOTE: (1) / : Left side is the expected effect, and right side is its significance

(2) 0 : No effect expected
+ : Positive effect expected
- : Negative effect expected
± : Neutral effect expected, i.e. there maybe a change but such change will be neither beneficial nor harmful

(3) A : Effect which has relatively high level of significance
B : Effect which has relatively medium level of significance
C : Effect which has relatively low level of significance

表6．4－12　排水改善事業による環境への影響評価結果

Checklist Item	Malabon-Nabotas	East and West Mangahan Lakeshore Dike	East and West Mangahan Other Works	San Juan	Mandaluyong -Pasig	Marikina	Parañaque -Las Piñas	Valenzuela
A) Problems Due to Location								
1. Resettlement/Evacuation	-/C	-/C	-/C	-/C	-/C	-/C	-/C	-/C
2. Land value changes	+/A	+/A	+/A	+/A	+/A	+/A	+/A	+/A
3. Encroachment of precious ecology	0	0	0	0	0	0	0	0
4. Encroachment of historical/cultural values	0	0	0	0	0	0	0	0
5. Watershed erosion and silt runoff	0	0	0	0	0	0	0	0
6. Navigation	-/C	-/C	+/C	+/C	+/C	+/C	+/C	+/C
7. Effects on groundwater hydrology	0	0	0	0	0	0	0	0
8. Migrating valuable fish species	0	0	0	0	0	0	0	0
9. Inundation of land and mineral resources	0	0	0	0	0	0	0	0
B) Problems Related to Design								
1. Road erosion	0	0	0	0	0	0	0	0
2. Water right conflicts	0	0	0	0	0	0	0	0
3. Loss of community/ recreation areas	0	0	0	0	0	0	0	0
4. Intensification of traffic congestion	0	0	0	0	0	0	0	0
5. Aesthetics and landscape	+/A	+/A	+/A	+/A	+/A	+/A	+/A	+/A
6. Prevention of access	0	-/B	0	0	0	0	0	0
C) Problems in Construction Stage								
1. Soil erosion and silt runoff	-/C	-/B	-/C	-/C	-/C	-/C	-/C	-/C
2. Hazards to workers and nearby residents	0	0	0	0	0	0	0	0
3. Spread of communicable diseases	0	0	0	0	0	0	0	0
D) Problems in Operation Stage								
1. Water Quality	-/C	±	±	+/C	+/C	+/C	+/C	+/C
2. Eutrophication	0	0	0	0	0	0	0	0
3. Encroachment of precious ecology	0	0	0	0	0	0	0	0
4. Depreciation of fisheries	0	0	0	0	0	0	0	0
5. Vector disease hazards	0	0	0	0	0	0	0	0
6. Downstream erosion/ aggradation	0	0	0	0	0	0	0	0
7. Aesthetics and landscape	+/C	0	+/C	+/C	+/C	+/C	+/C	+/C

NOTE: (1) / : Left side is the expected effect, and right side is its significance

(2) 0 : No effect expected
+ : Positive effect expected
- : Negative effect expected
± : Neutral effect expected, i.e., there maybe a change but such change will be neither beneficial nor harmful

(3) A : Effect which has relatively high level of significance
B : Effect which has relatively medium level of significance
C : Effect which has relatively low level of significance

表7．1－1　　１９８６年土地利用下の代替案Ｂ／Ｃ比

RIVER SYSTEM	BENEFIT/COST RATIOS				
	100-YR	50-YR	30-YR	20-YR	10-YR
PASIG MARIKINA	0.84	0.88	0.88	0.86	0.82
BULI BAHO MAHABA	0.32	0.36	0.37	0.36	0.34
MALABON TULLAHAN	0.45	0.55	0.61	0.64	0.71
S.PARANAQUE LAS PINAS	0.63	0.69	0.73	0.74	0.76

DRAINAGE AREA	BENEFIT/COST RATIOS			
	10-YR	5-YR	3-YR	2-YR
MANILA	1.09	---	---	---
MALABON NAVOTAS	1.44	1.49	1.50	1.37
EAST OF MANGAHAN	1.01	1.08	1.11	1.07
WEST OF MANGAHAN	1.26	1.40	1.52	1.64
SAN JUAN	0.69	0.70	0.67	0.59
MANDALUYONG PASIG	0.79	0.82	0.84	0.96
MARIKINA	0.39	0.43	0.45	0.47
PARANAQUE LAS PINAS	0.68	0.76	0.86	0.96
VALENZUELA	0.81	0.82	0.71	0.50

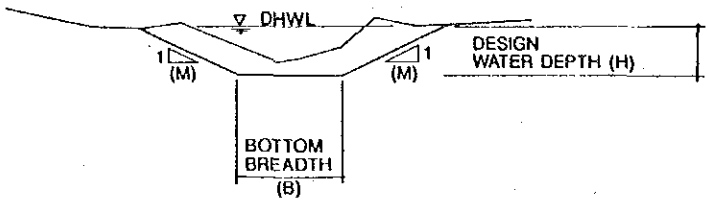
表7．2—1　マンガハン東西地区における最適なポンプと調整池の諸元

Subdrainage Area	Objective Discharge* For Land Use at 2020		Optimum Dimensions of Pump and Regulation Pond							Dimensions of Pump For Land Use at 2000	
			Pump Station		Regulation Pond						
	Discharge (m^3/s)	Specific Discharge ($m^3/s/km^2$)	Design Capacity (m^3/s)	Specific Discharge ($m^3/s/km^2$)	High Water Level EL (m)	Bottom Height EL (m)	Water Depth (m)	Area (m^2)	Volume (m^3)	Design Capacity (m^3/s)	Specific Discharge ($m^3/s/km^2$)
EM-1	8.1	4.9	9	5.4	13.0	-	-	-	-	8	4.8
2	10.8	4.5	11	4.5	12.5	-	-	-	-	8	3.3
3	6.7	2.5	5	1.8	12.5	9.5	3.0	6,000	18,000	5	1.8
4	5.1	2.6	2	1.0	12.0	9.0	3.0	11,000	33,000	2	1.0
WM-1	45.3	5.0	46	5.0	12.0	-	-	-	-	32	3.5
2	26.3	5.1	12	2.3	12.0	9.0	3.0	46,000	138,000	7	1.4
3	35.2	5.2	20	2.9	12.0	9.0	3.0	61,000	183,000	14	2.0
4	66.1	4.6	45	3.2	12.0	9.0	3.0	86,000	258,000	31	2.2
5	12.4	4.5	6	2.2	12.0	9.0	3.0	21,000	63,000	4	1.4

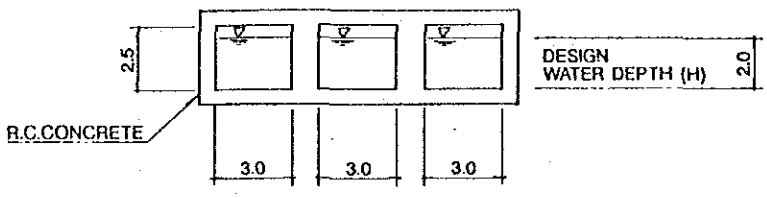
* Objective Discharge is the required pump capacity without the regulation pond.

表７．２－２(1/2) マンガハン東西地区における計画排水路の諸元

Sub-D.Area	Drainage Area (ha)	Design Discharge (m3/s)	Channel Gradient (1/I)	Roghness Co-efficient	Length Const. (m)	Length Impvt. (m)	Bottom Breadth (B:m)	Design W.Depth (H:m)	Type	Side Slope (M)	Channel Code	Remarks
EM-1	83.0	15	5000	0.030	700		8.6	2.0	Trape.	2.0	b	
	83.6	13	5000	0.030	1,100		7.1	2.0		2.0	a	
S-total	166.6				1,800							
EM-2	74.3	11	5000	0.030	800		5.7	2.0	Trape.	2.0	b	
	39.9	18	5000	0.030	700		10.7	2.0	Trape.	2.0	a-3	
	39.7	14	5000	0.030	550		7.9	2.0	Trape.	2.0	a-2	
	87.8	10	5000	0.030	750		5.0	2.0	Trape.	2.0	a-1	
S-total	241.7				2,800							
EM-3	80.5	7	5000	0.030	700		2.8	2.0	Trape.	2.0	b	
	40.9	11	5000	0.030	900		5.7	2.0	Trape.	2.0	a-3	
	65.6	9	5000	0.030	500		4.3	2.0	Trape.	2.0	a-2	
	85.2	5	5000	0.030	600		1.3	2.0	Trape.	2.0	a-1	
S-total	272.2				2,700							
EM-4	53.5	17	5000	0.030		400	10.0	2.0	Trape.	2.0	a-3	
	45.8	13	5000	0.030		350	7.1	2.0	Trape.	2.0	a-2	
	95.7	9	5000	0.030		350	4.3	2.0	Trape.	2.0	a-1	
S-total	195.0					1,100						
Total	875.5				7,300	1,100						



TYPICAL CROSS SECTION OF TRAPEZOIDAL CHANNEL

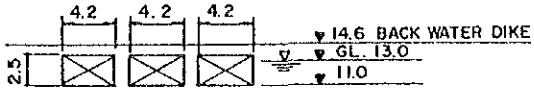
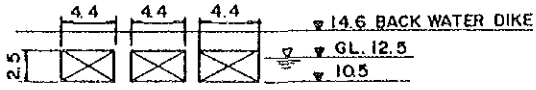
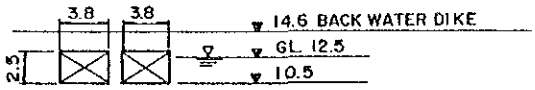
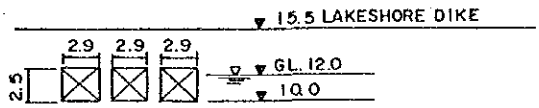
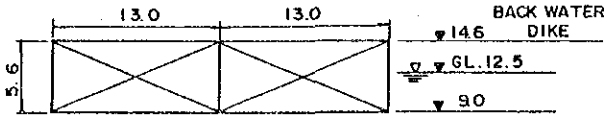
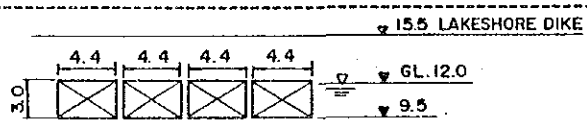
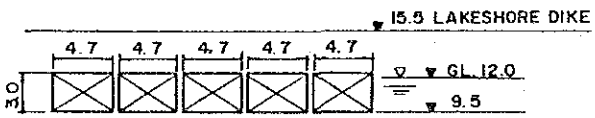
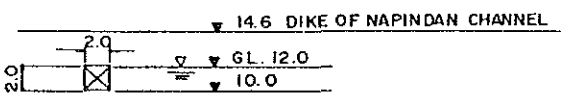
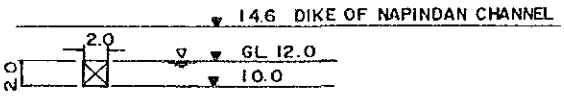
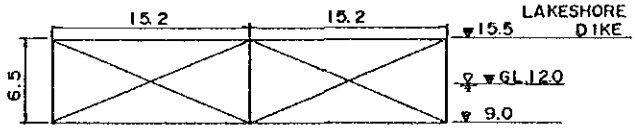
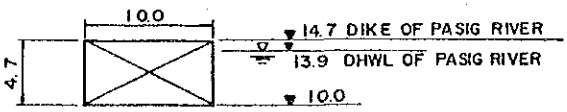
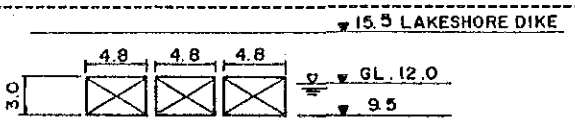


TYPICAL CROSS SECTION OF CLOSED CHANNEL
(THREE UNITS BOX CULVERT)

表7．2－2(2/2) マンガハン東西地区における計画排水路の諸元

Sub-D.Area	Drainage Area (ha)	Design Discharge (m3/s)	Channel Gradient (1/I)	Roghness Co-efficient	Length Const. (m)	Length Impvt. (m)	Bottom Breadth (B:m)	Design W.Depth (H:m)	Type	Side Slope (M)	Channel Code	Remarks
WM-1	34.9	25	5000	0.030	600		15.5	2.0	Trape.	2.0	f-3	
	51.3	20	5000	0.030	450		12.0	2.0	Trape.	2.0	f-2	
	81.5	13	5000	0.030	450		7.1	2.0	Trape.	2.0	f-1	
	22.2	35	1500	0.030		600	16.0	1.7	Trape.	2.0	e	
	46.1	20	1500	0.030		800	10.0	1.6	Trape.	2.0	d-2	
	85.4	13	1500	0.030		600	10.0	1.2	Trape.	2.0	d-1	
	22.3	20	1500	0.030		450	17.0	1.2	Trape.	2.0	c-2	
	92.0	17	1500	0.030		500	14.0	1.2	Trape.	2.0	c-1	
	50.0	64	2000	0.030		800	13.0	2.9	Trape.	2.0	b-2	
	55.8	64	2000	0.030		850	20.0	2.3	Trape.	2.0	b-2	
	133.2	55	2000	0.030		900	23.0	2.0	Trape.	2.0	b-1	
	79.7	27	1500	0.030		1,000	12.0	1.7	Trape.	2.0	a-5	
	50.3	18	1500	0.030		700	21.0	1.0	Trape.	2.0	a-4	
	36.3	13	1500	0.030		250	15.0	1.0	Trape.	2.0	a-3	
	0.0	13	1500	0.030	250		15.0	1.0	Trape.	2.0	a-2	
	71.1	9	1500	0.030	500		10.0	1.0	Trape.	2.0	a-1	
S-total	912.1				2,250	7,450						
WM-2	56.0	21	5000	0.030	1,100		12.7	2.0	Trape.	2.0	d-3	
	51.9	16	5000	0.030	550		9.3	2.0	Trape.	2.0	d-2	
	99.5	11	5000	0.030	500		5.7	2.0	Trape.	2.0	d-1	
	55.8	8	5000	0.030		850	8.0	1.5	Trape.	2.0	c	
	89.0	27	5000	0.030		1,000	17.0	2.0	Trape.	2.0	b	Antipolo
	79.5	17	5000	0.030		1,000	10.0	2.0	Trape.	2.0	a-2	
	82.7	9	5000	0.030		900	7.0	1.7	Trape.	2.0	a-1	S.Baho
S-total	514.4				2,150	3,750						
WM-3	29.3	14	5000	0.030	600		7.9	2.0	Trape.	2.0	g-2	
	57.2	10	5000	0.030	400		5.0	2.0	Trape.	2.0	g-1	
	29.8	20	5000	0.030	550		12.0	2.0	Trape.	2.0	f-3	
	20.6	16	5000	0.030	550		9.3	2.0	Trape.	2.0	f-2	
	89.8	13	5000	0.030	400		7.1	2.0	Trape.	2.0	f-1	
	35.6	19	5000	0.030		550	11.3	2.0	Trape.	2.0	e-2	
	88.8	14	5000	0.030	600		7.9	2.0	Trape.	2.0	e-1	
	19.9	15	5000	0.030		800	8.6	2.0	Trape.	2.0	d-2	
	76.1	12	5000	0.030		300	6.4	2.0	Trape.	2.0	d-1	
	22.3	39	3000	0.030		550	20.0	2.0	Trape.	2.0	c	
	25.0	39	3000	0.030		800	16.0	2.2	Trape.	2.0	c	
	35.0	39	3000	0.030		1,000	16.0	2.4	Trape.	2.0	c	
	6.4	29	5000	0.030		300	20.0	1.9	Trape.	2.0	b	
	27.4	18	5000	0.030		300	10.7	2.0	Trape.	2.0	a-3	
	39.6	15	5000	0.030		1,000	8.6	2.0	Trape.	2.0	a-2	
	80.4	10	5000	0.030		750	5.0	2.0	Trape.	2.0	a-1	
S-total	683.2				3,100	6,350						
WM-4	38.8	13	5000	0.030		1,400	11.0	1.7	Trape.	2.0	o-2	Tipas
	20.0	13	5000	0.030		500	8.0	1.9	Trape.	2.0	o-2	Tipas
	67.4	7	5000	0.030		900	2.8	2.0	Trape.	2.0	o-1	Tipas
	92.2	17	5000	0.030	550		10.0	2.0	Trape.	2.0	n	
	62.1	11	5000	0.030	600		5.7	2.0	Trape.	2.0	m	
	42.7	25	5000	0.030		350	15.5	2.0	Trape.	2.0	l-2	
	97.1	18	5000	0.030		250	10.7	2.0	Trape.	2.0	l-1	
	128.4	21	5000	0.030		800	12.7	2.0	Trape.	2.0	k	Ususan
	41.2	42	2000	0.030		900	17.0	2.0	Trape.	2.0	j	Ususan
	47.9	30	500	0.030		500	2.0	2.5	Trape.	2.0	i-4	Ususan
	60.2	25	5000	0.030		1,350	15.5	2.0	Trape.	2.0	i-3	Ususan
	27.9	19	5000	0.030		200	11.3	2.0	Trape.	2.0	i-2	Ususan
	0.0	19	5000	0.015	250		9.0	2.0	B.Culvert	0.0	i-1	B=3.0m*3units
	55.6	19	5000	0.015	600		9.0	2.0	B.Culvert	0.0	h-2	B=3.0m*3units
	80.7	12	5000	0.015	600		6.0	2.0	B.Culvert	0.0	h-1	B=3.0m*2units
	12.4	17	5000	0.030		500	10.0	2.0	Trape.	2.0	g-2	
	102.1	16	5000	0.030		500	9.3	2.0	Trape.	2.0	g-1	
	19.3	14	5000	0.030	600		7.9	2.0	Trape.	2.0	f-2	
	73.5	12	5000	0.030	400		6.4	2.0	Trape.	2.0	f-1	
	67.7	91	5000	0.030		800	30.0	3.0	Trape.	2.0	e	Taguig
	12.3	83	5000	0.030		1,000	30.0	2.8	Trape.	2.0	d	Taguig
	24.2	67	5000	0.030		1,450	27.0	2.7	Trape.	2.0	c	Taguig
	12.2	29	5000	0.030		400	11.0	2.6	Trape.	2.0	b	Taguig
	64.5	21	5000	0.030		1,300	8.0	2.5	Trape.	2.0	a-5	Taguig
	31.1	16	5000	0.030		500	6.0	2.4	Trape.	2.0	a-4	Taguig
	45.6	13	5000	0.030		800	5.0	2.4	Trape.	2.0	a-3	Taguig
	49.3	9	5000	0.030		900	2.0	2.4	Trape.	2.0	a-2	Taguig
	51.2	5	5000	0.030		350	1.0	2.4	Trape.	2.0	a-1	Taguig
S-total	1,427.6				3,600	15,650						
WM-5	33.0	36	5000	0.030		350	15.0	2.5	Trape.	2.0	c	
	40.9	21	5000	0.030		550	12.7	2.0	Trape.	2.0	b-2	
	101.5	15	5000	0.030	550		8.6	2.0	Trape.	2.0	b-1	
	23.6	17	5000	0.030	400		10.0	2.0	Trape.	2.0	a-2	
	78.3	14	5000	0.030	400		7.9	2.0	Trape.	2.0	a-1	
S-total	277.3				1,350	900						
Total	3,814.6				12,450	34,100						

表７．２－３　マンガハン東西地区における計画樋門（管）の諸元

DRAINAGE AREA	LOCATION	DESIGN DISCHARGE (M3/S)	TYPE	CROSS SECTION
EM-1	Buli River STA.0+000	25	Box culvert/Sluice appurtenant to Pump Station	
EM-2	Baho River STA.0+000	26	Box culvert/Sluice appurtenant to Pump Station	
EM-3	Mahaba River STA.0+000	15	Box culvert/Sluice appurtenant to Pump Station	
EM-4	Lakeshore Dike	17	Box culvert/Sluice appurtenant to Pump Station	
WM-1	Napindan R. Lower Buli R.	78	Open channel/Sluice appurtenant to Pump Station	
	Antipolo R. STA.0+800	*	Open channel/Sluice	
WM-2	Lakeshore Dike Anti Polo R. STA.3+100	44	Box culvert/Sluice appurtenant to Pump Station	
WM-3	Lakeshore Dike Labsan R. STA.1+800	58	Box culvert/Sluice appurtenant to Pump Station	
	Napindan C. STA.1+628	*	Box culvert/Sluice	
	Napindan C. STA.3+906	*	Box culvert/Sluice	
WM-4	Lakeshore Dike Taguig R. STA.7+970	91	Open channel/Sluice appurtenant to Pump Station	
	Tipas R. STA.2+010	*	Open channel/Sluice	
	Taguig R. STA.0+000	Navi.	Open channel/Sluice	
WM-5	Lakeshore Dike Bicutan R.	36	Box culvert/Sluice appurtenant to Pump Station	

NOTE: Design discharge of "*" presents that the gate size is determined from its maintenance function.

表7．2—4　提案プロジェクトの設計と建設で必要な人員とその役割

Position	Required Activity	Number of Staff
Project Manager	Management of all activities for the design and construction.	1
(Design and Construction Unit)		
Supervising Engineer	Supervision of all activities in the unit.	1
Senior Civil Engineer	Supervision of design and construction of rivers/channels, lakeshore dike, pump stations/gates and bridges.	4
Senior Mechanical/ Electrical Engineer	Supervision of the design and installment of machines, auxilliary equipment and accessories of the related facilities such as pump stations and flood gates.	2
Sub-total		7
(Administrative Unit)		
Senior Administrative Officer	Supervisor of all work in the unit.	1
Administrative Officer/Secretary	Administrative affairs, general clerical work, filing and accounting for the office.	1
Sub-total		2
Total		10

表7．２－５(1/2) 提案プロジェクトの維持管理で必要な人員とその役割

Position	Required Activity	Number of Staff
Chief Supervising Engineer /1	Supervision of all activities for the operation and maintenance of the proposed project, including the maintenance activities in the Engineering District Office.	1
(Flood/Drainage Control Unit)		
Supervising Engineer	Supervision of all activities in this unit. Study of optimum operation method of MCGS, pump stations and gates in flood season. Formulation of the technical training program of operation and maintenance for all the staff concerned.	1
Senior Hydrologist/ Civil Engineer	Hydro-meteorological data collection and analysis and flood predicition.	1
Hydrologist/ Civil Engineer	Assistant of senior hydrologist.	1
Senior Civil Engineer	Preparation of programs for the rehabilitation and maintenance of river, channels and bridges, and buildings, etc. of pump stations, gates and MCGS.	1
Civil Engineer	Assistant of senior civil engineer.	1
Senior Mechanical/ Electrical Engineer	Preparation of programs for the rehabilitation and maintenance of machines and auxilliary equipment and accessories of the pump stations and gates.	1
Mechanical/Electrical Engineer	Assistant of mechanical/electrical engineer.	1
Senior Telecommunication Engineer	Preparation of programs for the rehabilitation and maintenance of telecommunication facilities. Supervision of usual and special maintenance activities for these facilities.	1
Telecommunication Engineer	Special inspection of telecommunication facilities installed in the O&M division, covering both external and internal inspections, including the change of parts. This is carried out monthly, annually, before the flood season, and in emergency situations when an abnormal condition has been detected during the usual inspections. Usual external inspection and operation of telecommunication facilities are carried out every day.	1
Sub-total		9
(Administrative Unit) Administrative Officer/Secretary	General clerical work and accounting for the office.	2
Total		12

/1: The staff of a private company and casual employees will be hired to perform the work of assistants such as labourer, typist, guard, driver, etc.

On the O&M of the Pasig-Marikina River, the dissemination of the control method of MCGS, pump stations, and gates, and flood forecasting, with the permission of Director of DPWH-NCR and top official of the flood control and drainage office in DPWH-NCR.

表７．２－５(2/2) 提案プロジェクトの維持管理で必要な人員とその役割

Position	Required Activity	Number of Staff
(At the Site of Engineering District Office) /1		
Senior Civil Engineer	Supervision of all maintenance activities regarding the project in the district area.	1
Civil Engineer	Inspection of river, channel, such as the condition of silting, floating garbage, squatters, river wall, embankment. This is carred out weekly, before/after the flood season, and in emergency situations like a flood disaster.	2
Mechanical/Electrical Engineer	Special inspection of machines and auxiliary equipment and accessories of the pump stations and gates, including those of MCGS, covering both external and internal inspections, including the change of parts. This is carried out monthly, annually, before the flood season, and in emergency situations when an abnormal condition has been detected during the usual inspection.	1
Telecommunication Engineer	Special inspection of telecommunication facilities installed in pump stations and gates, covering both external and internal inspections, including the change of parts. This is carried out monthly, annually, before the flood season, and in emergency situations when an abnormal condition has been detected during the usual inspection.	1
Total		5
(At the Site of MCGS) /1		
Senior Mechanical/ Electrical Engineer	Supervision of all operation and maintenance activities of MCGS.	1
Mechanical/Electrical Engineer	Daily usual inspection of mechanial, electrical and telecommunication facilities and operation of gate.	2
Civil Engineer	Daily usual inspection of the structure and surrounding condition.	1
Total		4
(At the Site of Pump Station) /1		
Mechanical/Electrical Engineer	O&M activity of the pump station. Daily usual inspection of mechanical, electrical and telecommunication facilities, including surrounding condition.	2
(At the Site of Flood Gate) /1		
Mechanic/Electrician	Operation and maintenance activity of gate. Daily usual inspection of mechanical, electrical and telecommunication facilities, including surrounding condition.	1

/1: Casual employees will be contracted to execute the assistant work such as labourer, guard, driver, etc.

表７．２－６(1/2) マンガハン東西地区排水改善プロジェクト最適案の工費詳細

1US$=132Yen=21.3Peso

Work Item	Feature	Unit	Quantity	Total (1000P)	Foreign Currency (1000P)	Local Currency (1000P)
1 Lakeshore Dike				587,652	499,105	88,547
Preparatory Works *1)		l/s	1	97,942	83,184	14,758
Earth dike w/ sheet pile	L=10,700m H=4m	cu.m	872,000	299,090	269,181	29,909
Sluice Gate		ton	240	110,880	90,922	19,958
Box culvert type	2.5m*2.9m*3no.	ton	20	9,240	7,577	1,663
Box culvert type	3.0m*4.4m*4no.	ton	40	18,480	15,154	3,326
Box culvert type	3.0m*4.7m*5no.	ton	50	23,100	18,942	4,158
Open channel type	6.5m*15.2m*2no.	ton	100	46,200	37,884	8,316
Box culvert type	3.0m*4.8m*3no.	ton	30	13,860	11,365	2,495
Maintenance bridge				79,740	55,818	23,922
Napindan channel	130m*9.1m	sq.m	1,170	23,400	16,380	7,020
Mangahan floodway	250m*9.1m	sq.m	2,250	45,000	31,500	13,500
Mangahan diversion	60m*9.1m	sq.m	540	7,560	5,292	2,268
Lower bicutan	30m*9.1m	sq.m	270	3,780	2,646	1,134
2 River Channel Works				163,396	136,865	26,531
Preparatory Works *1)		l/s	1	27,233	22,811	4,422
Napindan River				70,162	59,638	10,524
Dredging		cu.m	583,200	59,483	50,561	8,922
Parapet wall	L=2495m	cu.m	1,200	3,743	3,182	561
Embankment	L=2747m	cu.m	98,500	3,942	3,351	591
Revetment		sq.m	5,000	2,994	2,545	449
Buli River	L=1600m			8,520	6,090	2,430
Embankment		cu.m	14,700	840	714	126
Re-con bridge	2 bridges	sq.m	960	7,680	5,376	2,304
Baho River	L=1800m			587	499	88
Embankment		cu.m	14,700	587	499	88
Mahaba River	L=2400m			4,138	2,985	1,154
Embankment		cu.m	14,600	586	498	88
Re-con bridge	2 bridges	sq.m	444	3,552	2,486	1,066
Mangahan Diversion	L=3900m			50,828	43,204	7,624
Excavation		cu.m	723,900	49,327	41,928	7,399
Embankment		cu.m	37,500	1,501	1,276	225
Lower Bicutan River	L=800m			1,928	1,639	289
Dredging		cu.m	4,000	276	235	41
Embankment		cu.m	41,300	1,652	1,404	248

- CONTINUED -

表7．2－6(2/2) マンガハン東西地区排水改善プロジェクト最適案の工費詳細

1US$=132Yen=21.3Peso

Work Item	Feature	Unit	Quantity	Total (1000P)	Foreign Currency (1000P)	Local Currency (1000P)
3 Drainage System				1,280,678	1,142,491	138,187
Preparatory Works *1)		l/s	1	213,446	190,415	23,031
Regulaton Pond	6sites	cu.m	693,000	95,600	78,392	17,208
Channel Works				219,100	178,545	40,555
Drainage channel impvt.	L=35200m	l/s	1	65,300	55,505	9,795
Const. of open channel	L=18300m	l/s	1	131,100	104,880	26,220
Const. of closed channel	L=1450m	l/s	1	22,700	18,160	4,540
Sluice Gate	9sites	ton	186	85,932	70,464	15,468
Box culvert type	2.5m*4.2m*3no.	ton	24	11,088	9,092	1,996
Box culvert type	2.5m*4.4m*3no.	ton	25	11,550	9,471	2,079
Box culvert type	2.5m*3.8m*2no.	ton	15	6,930	5,683	1,247
Open channel type	5.6m*13.m*2no.	ton	90	41,580	34,096	7,484
Open channel type	2.0m*2.0m	ton	3	1,386	1,137	249
Box culvert type	2.0m*2.0m	ton	3	1,386	1,137	249
Box culvert type	2.0m*2.0m	ton	3	1,386	1,137	249
Open channel type	2.0m*2.0m	ton	3	1,386	1,137	249
Open channel type	4.7m*10.m	ton	20	9,240	7,577	1,663
Pump Station	9sites	cu.ms	111	609,300	578,835	30,465
		cu.ms	8	44,800	42,560	2,240
		cu.ms	8	44,800	42,560	2,240
		cu.ms	5	28,000	26,600	1,400
		cu.ms	2	26,000	24,700	1,300
		cu.ms	32	150,400	142,880	7,520
		cu.ms	7	39,200	37,240	1,960
		cu.ms	14	78,400	74,480	3,920
		cu.ms	31	145,700	138,415	7,285
		cu.ms	4	52,000	49,400	2,600
Lateral		m	114,500	57,300	45,840	11,460
Sub-Total(1+2+3)				2,031,726	1,778,461	253,265
4 Administration *2)		l/s	1	101,586	0	101,586
5 Engineering Services		l/s	1	102,240	92,016	10,224
6 Physical Contingency *3)		l/s	1	223,555	187,048	36,508
7 Land Acquisition & Compensation		ha	91	185,434	0	185,434
Total(1+2+3+4+5+6+7)				2,644,542	2,057,524	587,017
8 Price Contingency *4)				167,013	0	167,013
9 Grand total				2,811,555	2,057,524	754,030

Notes:
1);20% of main civil works
2); 5% of main civil works(1+2+3)
3);10% of (1+2+3+4+5)
4); 0% for foreign currency and 6% for local currency

表７．２－７　マンガハン東西地区排水改善プロジェクト工費支出計画

UNIT : THOUSAND US$

	WORK ITEM	TOTAL			1991		1992		1993		1994	
		TOTAL	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.
1.	PREPARATORY WORKS	15,898	13,916	1,982	4,976	900	8,940	1,081	0	0	0	0
2.	CONSTRUCTION WORKS	79,488	69,580	9,908	4,882	866	21,566	3,014	21,566	3,014	21,566	3,014
	2.1 LAKESHORE DIKE	22,991	19,527	3,464	4,882	866	4,882	866	4,882	866	4,882	866
	2.2 RIVER CHANNEL WORKS	6,392	5,355	1,037	0	0	1,785	346	1,785	346	1,785	346
	2.3 DRAINAGE SYSTEM	50,105	44,698	5,407	0	0	14,899	1,802	14,899	1,802	14,899	1,802
	TOTAL OF 1.+2.	95,386	83,496	11,890	9,858	1,766	30,506	4,095	21,566	3,014	21,566	3,014
3.	ADMINISTRATION	4,769	0	4,769	0	581	0	1,730	0	1,229	0	1,229
4.	ENGINEERING SERVICES	4,800	4,320	480	1,080	120	1,080	120	1,080	120	1,080	120
	TOTAL OF 1. TO 4.	104,955	87,816	17,139	10,938	2,467	31,586	5,945	22,646	4,363	22,646	4,363
5.	PHYSICAL CONTINGENCY (10% of the above total)	10,496	8,782	1,714	1,094	247	3,159	595	2,265	436	2,265	436
6.	LAND ACQUISISTION & COMPENSATION	8,706	0	8,706	0	4,353	0	4,353	0	0	0	0
	TOTAL OF 1. TO 6.	124,157	96,598	27,559	12,032	7,067	34,744	10,893	24,911	4,799	24,911	4,799
7.	PRICE CONTINGENCY (F.C.:0% L.C.:6%)	7,841	0	7,841	0	1,350	0	2,859	0	1,623	0	2,009
	GRAND TOTAL	131,997	96,598	35,400	12,032	8,417	34,744	13,752	24,911	6,423	24,911	6,808

NOTE : Figures may not add up to totals due to rounding.
Currency conversion rates are 1.00 US$ = 132 Yen = 21.30 Peso.

表7．2－8　マンガハン東西地区のプロジェクト有無による氾濫水位

Name of Sub-drainage Area	W/ or W/O Project	Maximum Inundation Water Level (E.L.m) 2-Yr. Return Period	3-Yr. Return Period	5-Yr. Return Period	10-Yr. Return Period	30-Yr. Return Period	50-Yr. Return Period	100-Yr. Return Period
EAST OF MANGAHAN								
EM-1	W/O	13.40	13.52	13.68	14.02	14.32	14.48	14.56
	W/	-	-	-	13.23	13.29	14.48	14.56
EM-2	W/O	12.78	13.00	13.12	13.39	13.65	13.86	14.08
	W/	-	-	-	12.73	12.79	13.86	14.08
EM-3	W/O	12.80	13.01	13.16	13.25	13.65	13.86	14.08
	W/	-	-	-	12.73	12.78	13.86	14.08
EM-4	W/O	12.40	12.57	12.85	13.22	13.65	13.86	14.08
	W/	-	-	-	12.26	12.38	13.86	14.08
WEST OF MANGAHAN								
WM-1	W/O	12.55	12.60	12.85	13.22	13.65	13.86	14.08
	W/	-	-	-	12.24	12.31	13.86	14.08
WM-2	W/O	12.15	12.50	12.85	13.22	13.65	13.86	14.08
	W/	-	-	-	11.79	12.00	13.86	14.08
WM-3	W/O	12.15	12.50	12.85	13.22	13.65	13.86	14.08
	W/	-	-	-	11.77	11.92	13.86	14.08
WM-4	W/O	12.35	12.50	12.85	13.22	13.65	13.86	14.08
	W/	-	-	-	12.00	12.08	13.86	14.08
WM-5	W/O	12.15	12.50	12.85	13.22	13.65	13.86	14.08
	W/	-	-	-	11.96	12.06	13.86	14.08

表７．２－９　マンガハン東西地区排水改善プロジェクトの年平均便益の計算

Unit: million peso

FLOOD RETURN PERIOD	FLOOD DAMAGE W/O PROJECT	FLOOD DAMAGE W/ PROJECT	REDUCTION	AVERAGE	EXPECTATION	BENEFIT
				167.1	0.50000	83.6
2-yr.	334.2	0.0	334.2			
				424.3	0.16667	70.7
3-yr.	514.4	0.0	514.4			
				687.0	0.13333	91.6
5-yr.	859.5	0.0	859.5			
				959.3	0.10000	95.9
10-yr.	1,214.4	155.3	1,059.1			
				1,194.2	0.06667	79.6
30-yr.	1,528.4	199.2	1,329.2			
				664.6	0.01333	8.9
50-yr.	1,633.6	1,633.6	0.0			
				0.0	0.01000	0.0
100-yr.	1,734.1	1,734.1	0.0			
					TOTAL	430.3

表7．2—10　マンガハン東西地区排水改善プロジェクトのキャッシュフロー

Unit : Million Peso

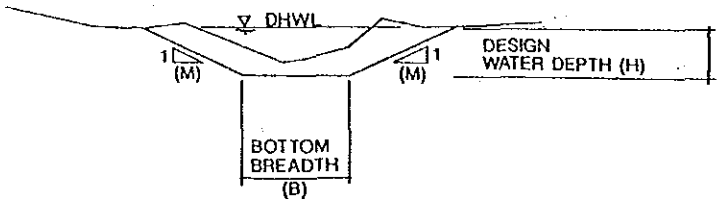
NO.	YEAR	ECONOMIC COST				ANNUAL AVERAGE BENEFIT	ANNUAL CASH FLOW
		CONSTRUC-TION	LAND ACQUISITION	OMR	TOTAL		
1	1991	282.7	92.7		375.4	0.0	(375.4)
2	1992	791.4	92.7		884.1	107.6	(776.5)
3	1993	569.5			569.5	215.1	(354.4)
4	1994	569.5			569.5	322.7	(246.8)
5	1995			39.1	39.1	430.3	391.2
6	1996			39.1	39.1	430.3	391.2
7	1997			39.1	39.1	430.3	391.2
8	1998			39.1	39.1	430.3	391.2
9	1999			39.1	39.1	430.3	391.2
10	2000			39.1	39.1	430.3	391.2
11	2001			39.1	39.1	430.3	391.2
12	2002			39.1	39.1	430.3	391.2
13	2003			39.1	39.1	430.3	391.2
14	2004			39.1	39.1	430.3	391.2
15	2005			39.1	39.1	430.3	391.2
16	2006			39.1	39.1	430.3	391.2
17	2007			39.1	39.1	430.3	391.2
18	2008			39.1	39.1	430.3	391.2
19	2009			39.1	39.1	430.3	391.2
20	2010			39.1	39.1	430.3	391.2
21	2011			39.1	39.1	430.3	391.2
22	2012			39.1	39.1	430.3	391.2
23	2013			39.1	39.1	430.3	391.2
24	2014			39.1	39.1	430.3	391.2
25	2015			39.1	39.1	430.3	391.2
26	2016			39.1	39.1	430.3	391.2
27	2017			39.1	39.1	430.3	391.2
28	2018			39.1	39.1	430.3	391.2
29	2019			39.1	39.1	430.3	391.2
30	2020			39.1	39.1	430.3	391.2
31	2021			39.1	39.1	430.3	391.2
32	2022			39.1	39.1	430.3	391.2
33	2023			39.1	39.1	430.3	391.2
34	2024			39.1	39.1	430.3	391.2
35	2025			39.1	39.1	430.3	391.2
36	2026			39.1	39.1	430.3	391.2
37	2027			39.1	39.1	430.3	391.2
38	2028			39.1	39.1	430.3	391.2
39	2029			39.1	39.1	430.3	391.2
40	2030			39.1	39.1	430.3	391.2
					IRR =	16.81%	
					B/C =	1.11	
					NPV =	193.58	

表7．3—1　マラボン川南部排水システムの代替案費用詳細

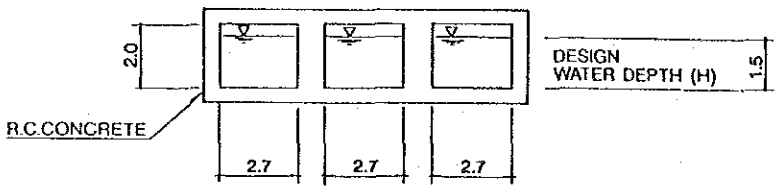
ITEM	UNIT	ALTERNATIVE CASE 1		ALTERNATIVE CASE 2		ALTERNATIVE CASE 3	
		QUANTITY	COST (MIL.PESO)	QUANTITY	COST (MIL.PESO)	QUANTITY	COST (MIL.PESO)
1 Main Civil Works			212		265		417
Dike	m	13,200	62	9,800	52	4,700	36
Embankment w/ Revetment	m	3,600	13	3,600	13	3,600	13
Embankment w/o Revetment	m	0	0	0	0	0	0
Parapet Wall	m	8,500	26	5,100	16	0	0
Coastal Dike	m	1,100	23	1,100	23	1,100	23
Drainage Channel Impvt.	m	2,400	6	1,600	2	1,600	2
Gate	site	5		5		4	
	ton	64	29	99	45	158	73
Pump Station	site	3		3		2	
	cu.ms	12	114	20	166	30	306
2 Preparatory Works & Others	l/s	1	124	1	155	1	243
3 Land Acquisition & Compensation	ha	9	63	8	42	7	29
Sub-Total(1+2+3)			398		462		689
4 Operation, Maintenance & Replacement Cost	l/s	1	24	1	34	1	62
Total			423		497		751

表7．3—2　マラボン・ナボタス地区の計画排水路の諸元

Sub-D.Area	Drainage Area (ha)	Design Discharge (m3/s)	Channel Gradient (1/I)	Roghness Co-efficient	Length Const. (m)	Length Impvt. (m)	Bottom Breadth (B:m)	Design W.Depth (H:m)	Type	Side Slope (M)	Remarks
MA-1-A	53.0	13	1500	0.030		600	4.0	2.0	Trape.	2.0	Panghulo
	60.0	13	1500	0.030	1,000		4.0	2.0	Trape.	2.0	
S-total	113.0				1,000	600					
MA-6	64.0	25	2000	0.030		300	10.0	2.0	Trape.	2.0	Catmon
	70.0	25	2000	0.030		400	15.0	1.6	Trape.	2.0	Catmon
	34.0	7	5000	0.030	400		6.5	1.5	Trape.	2.0	
	34.0	7	5000	0.030	500		6.5	1.5	Trape.	2.0	
S-total	202.0				900	700					
MA-11	69.0	12	5000	0.015	800		8.1	1.5	B.Culvert	0.0	B=2.7m*3units
S-total	69.0				800						
Total	384.0				2,700	1,300					

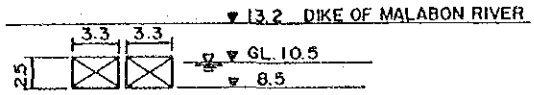
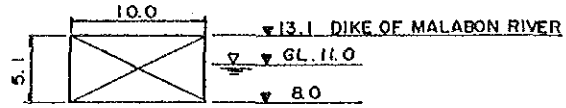
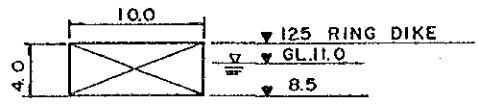
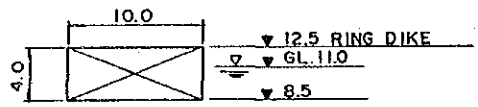
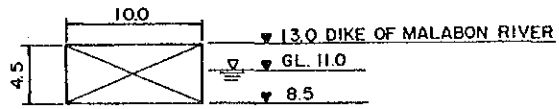
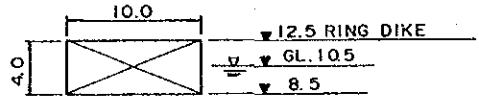
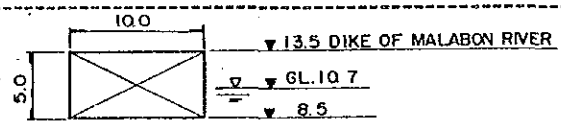
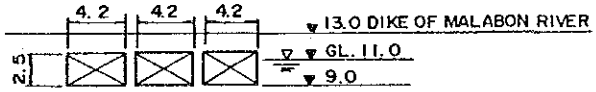
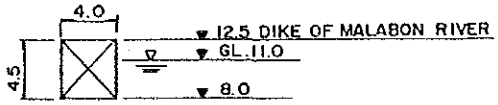
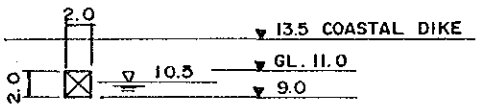
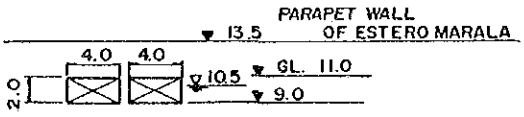
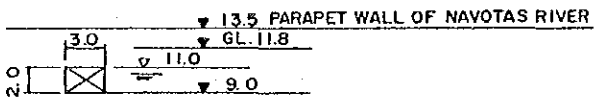


TYPICAL CROSS SECTION OF TRAPEZOIDAL CHANNEL



TYPICAL CROSS SECTION OF CLOSED CHANNEL
(THREE UNITS BOX CULVERT)

表7．3—3　マラボン・ナボタス地区の計画樋門（管）諸元

DRAINAGE AREA	LOCATION	DESIGN DISCHARGE (M3/S)	TYPE	CROSS SECTION
MA-1-A	Saltolan R. STA.0+000	13	Box culvert/Sluice appurtenant to Pump Station	
MA-1-B	Pinagkabalian STA.0+000	Navi.	Open channel/Sluice appurtenant to Pump Station	
	Pinagkabalian STA.2+200	Navi.	Open channel/Sluice	
MA-2-B	Dampalit R. STA.5+400	Navi.	Open channel/Sluice	
	Dampalit R. STA.0+000	Navi.	Open channel/Sluice	
MA-3	Dampalit R. STA.2+200	Navi.	Open channel/Sluice	
MA-5	Navotas R. STA.2+865	Navi.	Open channel/Sluice	
MA-6	Catmon Creek STA.0+000	25	Box culvert/Sluice appurtenant to Pump Station	
	Longos Creek STA.0+000	*	Box culvert/Sluice	
MA-9	Coastal Dike	2	Box culvert/Sluice appurtenant to Pump Station	
MA-11	Estero Marala STA.0+950	12	Box culvert/Sluice appurtenant to Pump Station	
	Dagat Dagatan Navotas R. STA.2+250	*	Box culvert/Sluice	

NOTE: Design discharge of "*" presents that the gate size is determined from its maintenance function.
Design discharge of "Navi." presents that the gate size is determined considering navigatin of vessels.

表7．３－４(1/2) マラボン・ナボタス地区排水改善プロジェクトの最適案の工費詳細

1US$=132Yen=21.3Peso

Work Item	Feature	Unit	Quantity	Total (1000P)	Foreign Currency (1000P)	Local Currency (1000P)
1 North of Malabon River				340,714	296,995	43,719
Preparatory Works *1)		l/s	1	56,786	49,499	7,286
Ring Dike		m	15,900	27,918	23,730	4,188
Coastal Dike(w/ revetment)	EL.13.5m/H=2.5m	m	5,700			
River Dike(w/ revetment)	Raising H=1m	m	3,500			
Ring Dike(w/o revetment)	Raising H=1m	m	6,700			
Embankment		cu.m	184,500	7,380	6,273	1,107
Revetment		sq.m	34,200	20,538	17,457	3,081
Channel Works			1,600	7,952		
Drainage channel impvt.		m	600	852	724	128
Const. of open channel		m	1,000	7,100	5,680	1,420
Lateral		m	31,200	15,600	12,480	3,120
Pump	3sites	cu.ms	25	159,000	151,050	7,950
		cu.ms	2	26,000	24,700	1,300
		cu.ms	3	39,000	37,050	1,950
		cu.ms	20	94,000	89,300	4,700
Sluice Gate	7sites	ton	159	73,458	60,236	13,222
Box culvert type	2.5m*3.3m*2no.	ton	14	6,468	5,304	1,164
Open channel type	5.1m*10.m	ton	30	13,860	11,365	2,495
Open channel type	4.0m*10.m	ton	20	9,240	7,577	1,663
Open channel type	4.0m*10.m	ton	20	9,240	7,577	1,663
Open channel type	4.5m*10.m	ton	25	11,550	9,471	2,079
Open channel type	4.0m*10.m	ton	20	9,240	7,577	1,663
Open channel type	5.0m*10.m	ton	30	13,860	11,365	2,495
2 Navigation Lock				98,650	83,374	15,276
Preparatory Works *1)		l/s	1	16,442	13,896	2,546
Excavation		cu.m	9,000	495	421	74
Backfill		cu.m	250,000	10,000	8,500	1,500
Riprap		sq.m	900	90	77	14
RC-pile		m	3,950	1,185	1,007	178
Revetment		sq.m	3,800	2,280	1,938	342
Mass concrete		cu.m	340	510	434	77
Reinforced concrete		cu.m	9,800	39,200	33,320	5,880
Steel sheet pile		sq.m	1,000	3,500	3,325	175
Gate		ton	180	24,948	20,457	4,491

- CONTINUED -

表７．３－４(2/2) マラボン・ナボタス地区排水改善プロジェクトの最適案の工費詳細

1US$=132Yen=21.3Peso

Work Item	Feature	Unit	Quantity	Total (1000P)	Foreign Currency (1000P)	Local Currency (1000P)
3 South of Malabon River				283,950	235,916	48,034
Preparatory Works *1)		l/s	1	47,325	39,319	8,006
Ring Dike		m	13,200	61,506	49,900	11,606
Coastal Dike(w/ revetment)	EL.13.5m/H=2.5m	m	1,100			
River Dike(w/ revetment)	Raising H=1m	m	3,600			
Parapet Wall,reinforced conc.		m	8,500			
Embankment		cu.m	133,200	5,328	4,529	799
Revetment		sq.m	14,300	8,578	7,291	
Reinforced concrete		cu.m	11,900	47,600	38,080	1,287
Channel Works		m	2,400	16,759		
Drainage channel impvt.		m	700	1,274	1,083	191
Const. of open channel		m	900	5,085	4,068	1,017
Const. of closed channel		m	800	10,400	8,320	2,080
Lateral		m	5,900	2,950	2,360	590
Pump	3sites	cu.ms	10	130,000	123,500	6,500
		cu.ms	4	52,000	49,400	2,600
		cu.ms	2	26,000	24,700	1,300
		cu.ms	4	52,000	49,400	2,600
Sluice Gate	5sites	ton	55	25,410	20,836	4,574
Box culvert type	2.5m*4.2m*3no.	ton	24	11,088	9,092	
Box culvert type	4.5m*4.0m	ton	12	5,544	4,546	
Box culvert type	2.0m*2.0m	ton	3	1,386	1,137	
Box culvert type	2.0m*4.0m*2no.	ton	12	5,544	4,546	
Box culvert type	2.0m*3.0m	ton	4	1,848	1,515	
Sub-Total(1+2+3)				723,313	616,285	107,029
4 Administration *2)		l/s	1	36,166	0	36,166
5 Engineering Services		l/s	1	85,200	76,680	8,520
6 Physical Contingency *3)		l/s	1	84,468	69,296	15,171
7 Land Acquisition & Compensation		ha	28	109,200	0	109,200
Total(1+2+3+4+5+6+7)				1,038,347	762,261	276,086
8 Price Contingency *4)				76,936	0	76,936
9 Grand Total				1,115,282	762,261	353,021

Notes:
1);20% of main civil works
2); 5% of main civil works(1+2+3)
3);10% of (1+2+3+4+5)
4); 0% for foreign currency and 6% for local currency

表7．3—5　マラボン・ナボタス地区排水改善プロジェクト工費支出計画

UNIT : THOUSAND US$

	WORK ITEM	TOTAL			1991		1992		1993		1994	
		TOTAL	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.
1.	PREPARATORY WORKS	5,660	4,822	838	930	137	3,196	598	697	103	0	0
2.	CONSTRUCTION WORKS	28,298	24,111	4,187	2,905	428	7,069	1,253	7,069	1,253	7,069	1,253
	2.1 NORTH OF MALABON RIVER	13,330	11,619	1,711	2,905	428	2,905	428	2,905	428	2,905	428
	2.2 NAVIGATION LOCK	3,859	3,262	597	0	0	1,087	199	1,087	199	1,087	199
	2.3 SOUTH OF MALABON RIVER	11,109	9,230	1,879	0	0	3,077	626	3,077	626	3,077	626
	TOTAL OF 1.+2.	33,958	28,933	5,025	3,834	565	10,264	1,851	7,766	1,356	7,069	1,253
3.	ADMINISTRATION	1,698	0	1,698	0	220	0	606	0	456	0	416
4.	ENGINEERING SERVICES	4,000	3,600	400	900	100	900	100	900	100	900	100
	TOTAL OF 1. TO 4.	39,656	32,533	7,123	4,734	885	11,164	2,557	8,666	1,912	7,969	1,769
5.	PHYSICAL CONTINGENCY (10% of the above total)	3,966	3,253	712	473	88	1,116	256	867	191	797	177
6.	LAND ACQUISISTION & COMPENSATION	5,127	0	5,127	0	2,564	0	2,564	0	0	0	0
	TOTAL OF 1. TO 6.	48,748	35,786	12,962	5,208	3,537	12,281	5,376	9,532	2,103	8,766	1,946
7.	PRICE CONTINGENCY (F.C.:0% L.C.:6%)	3,612	0	3,612	0	676	0	1,411	0	711	0	814
	GRAND TOTAL	52,360	35,787	16,574	5,208	4,212	12,281	6,787	9,532	2,814	8,766	2,761

NOTE : Figures may not add up to totals due to rounding.
Currency conversion rates are 1.00 US$ = 132 Yen = 21.30 Peso.

表７．３－６　マラボン・ナボタス地区のプロジェクト有無による氾濫水位

Name of Sub-drainage Area	W/ or W/O Project	Maximum Inundation Water Level (E.L.m) 2-Yr. Return Period	3-Yr. Return Period	5-Yr. Return Period	10-Yr. Return Period	30-Yr. Return Period	50-Yr. Return Period	100-Yr. Return Period
MA-1	W/O	10.77	10.82	10.88	10.98	11.05	11.07	11.11
	W/	-	-	-	10.74	10.84	10.90	10.97
MA-2	W/O	10.73	10.77	10.83	10.92	11.03	11.07	11.11
	W/	-	-	-	10.77	10.87	10.92	10.99
MA-3	W/O	11.04	11.08	11.13	11.21	11.33	11.39	11.47
	W/	-	-	-	10.82	10.91	10.97	11.03
MA-4	W/O	11.05	11.08	11.12	11.19	11.28	11.34	11.41
	W/	-	-	-	10.82	10.91	10.97	11.03
MA-5	W/O	11.14	11.20	11.28	11.41	11.56	11.63	11.71
	W/	-	-	-	10.82	10.91	10.97	11.03
MA-6	W/O	10.99	11.02	11.05	11.11	11.23	11.25	11.31
	W/	-	-	-	10.92	10.98	11.02	11.05
MA-9	W/O	11.29	11.32	11.37	11.45	11.56	11.60	11.67
	W/	-	-	-	11.21	11.23	11.24	11.26
MA-11	W/O	11.11	11.17	11.24	11.37	11.53	11.59	11.66
	W/	-	-	-	10.92	10.95	10.97	11.00

表7．3—7　マラボン・ナボタス地区排水改善プロジェクトの年平均便益の計算

Unit: million peso

FLOOD RETURN PERIOD	FLOOD DAMAGE W/O PROJECT	FLOOD DAMAGE W/ PROJECT	REDUCTION	AVERAGE	EXPECTATION	BENEFIT
				99.2	0.50000	49.6
2-yr.	198.4	0.0	198.4			
				209.7	0.16667	35.0
3-yr.	221.1	0.0	221.1			
				235.3	0.13333	31.4
5-yr.	249.5	0.0	249.5			
				224.4	0.10000	22.4
10-yr.	283.8	84.5	199.3			
				219.8	0.06667	14.7
30-yr.	371.3	131.0	240.3			
				235.5	0.01333	3.1
50-yr.	391.0	160.4	230.6			
				236.1	0.01000	2.4
100-yr.	428.8	187.3	241.5			
					TOTAL	158.5

表7．3—8　マラボン・ナボタス地区排水改善プロジェクトのキャッシュフロー

Unit : Million Peso

NO.	YEAR	ECONOMIC COST				ANNUAL AVERAGE BENEFIT	ANNUAL CASH FLOW
		CONSTRUC-TION	LAND ACQUISITION	OMR	TOTAL		
1	1991	118.5	54.6		173.1		(173)
2	1992	289.3	54.6		343.9	39.6	(304)
3	1993	223.1			223.1	79.3	(144)
4	1994	205.3			205.3	118.9	(86)
5	1995			9.7	9.7	158.5	149
6	1996			9.7	9.7	158.5	149
7	1997			9.7	9.7	158.5	149
8	1998			9.7	9.7	158.5	149
9	1999			9.7	9.7	158.5	149
10	2000			9.7	9.7	158.5	149
11	2001			9.7	9.7	158.5	149
12	2002			9.7	9.7	158.5	149
13	2003			9.7	9.7	158.5	149
14	2004			9.7	9.7	158.5	149
15	2005			9.7	9.7	158.5	149
16	2006			9.7	9.7	158.5	149
17	2007			9.7	9.7	158.5	149
18	2008			9.7	9.7	158.5	149
19	2009			9.7	9.7	158.5	149
20	2010			9.7	9.7	158.5	149
21	2011			9.7	9.7	158.5	149
22	2012			9.7	9.7	158.5	149
23	2013			9.7	9.7	158.5	149
24	2014			9.7	9.7	158.5	149
25	2015			9.7	9.7	158.5	149
26	2016			9.7	9.7	158.5	149
27	2017			9.7	9.7	158.5	149
28	2018			9.7	9.7	158.5	149
29	2019			9.7	9.7	158.5	149
30	2020			9.7	9.7	158.5	149
31	2021			9.7	9.7	158.5	149
32	2022			9.7	9.7	158.5	149
33	2023			9.7	9.7	158.5	149
34	2024			9.7	9.7	158.5	149
35	2025			9.7	9.7	158.5	149
36	2026			9.7	9.7	158.5	149
37	2027			9.7	9.7	158.5	149
38	2028			9.7	9.7	158.5	149
39	2029			9.7	9.7	158.5	149
40	2030			9.7	9.7	158.5	149
					IRR =	15.90%	
					B/C =	1.05	
					NPV =	38.87	

表7．4－1(1/3) 堤内地の土地利用と地形

Station No.		Existing Elevation (1) Bank (m)	(2) Ground (m)	Designed Elevation (3) H.W.L. (m)	(4) Wall (m)	(5) 4-1 (m)	Condition of Land Side Utilization	Topography
No. 5+005	R	10.90	11.20	12.07	13.07	2.17	Office compound (Min. of Budget)	Flat land
	L	11.50	11.50	12.07	13.07	1.57	Factory compound	Flat land
No. 5+195	R	11.50	11.80	12.08	13.08	1.58	Hospital compound	Flat land
	L	12.20	12.50		13.08	0.88	Factory compound	Flat land
No. 5+395	R	11.70	12.10	12.09	13.09	1.39	Hospital compound	Flat land
	L	12.10	12.20		13.09	0.99	Factory compound	Flat land
No. 5+605	R	12.30	11.90	12.28	13.28	0.98	Malacanang Palace	Flat land
	L	12.10	12.30	12.28	13.28	1.18	Sante Banez Flood Gate	Flat land
No. 6+195	R	11.90	11.80	12.46	13.46	1.56	Malacanang Palace	Flat land
	L	12.70	12.30	12.46	13.46	0.76	Malacanang Park (Open space)	Flat land
No. 6+360	R	11.90	11.90	12.50	13.50	1.60	Malacanang Adm. Office	Flat land
	L	12.90	12.50	12.50	13.50	0.60	Malacanang Park (Open space)	Flat land
No. 6+480	R	11.50	11.50	12.54	13.54	2.04	Aviles Pump. Station (Residential area)	Flood land
	L	12.00	12.10	12.54	13.54	1.54	Malacanang Park (Open space)	Flood land
No. 6+650	R	13.00	11.40	12.58	13.58	0.58	Factory compound	Flat land
	L	13.00	13.80	12.58	13.58	0.58	Malacanang Park (Open space)	Flat land
No. 6+790	R	13.20	13.90	12.63	13.63	0.43	Factory compound	Flat land
	L	12.20	12.40	12.63	13.63	1.43	Office compound (City Engineer's Offic	Flat land
No. 6+895	R	12.90	13.70	12.67	13.67	0.77	Factory compound	Flat land
	L	12.60	12.60	12.67	13.67	1.07	Office compound (Open space)	Flat land
No. 7+095	R	12.50	12.90	12.72	13.72	1.22	- Unknown -	Flat land
	L	12.50	12.40	12.72	13.72	1.22	Factory compound (PHOC)	Flat land
No. 7+295	R	12.30	13.00	12.76	13.76	1.46	- Unknown -	Flat land
	L	12.70	12.50	12.76	13.76	1.06	Factory compound	Flat land
No. 7+470	R	13.00	13.80	12.83	13.83	0.83	PUP compound	Flat land
	L	12.40	12.40	12.83	13.83	1.43	Factory (Philippine Shell) compound	Flat land

表７．４－１(2/3) 堤内地の土地利用と地形

Station No.		Existing Elevation (1) Bank (m)	Existing Elevation (2) Ground (m)	Designed Elevation (3) H.W.L. (m)	Designed Elevation (4) Wall (m)	Designed Elevation (5) 4-1 (m)	Condition of Land Side Utilization	Condition of Land Side Topography
No. 7+615	R	12.60	13.20	12.90	13.90	1.30	PUP compound	Flat land
	L	11.70	11.80	12.90	13.90	2.20	Factory (Philippine Shell) compound	Flat land
No. 7+845	R	12.20	13.00	12.97	13.97	1.77	Petron Terminal	Flat land
	L	13.00	12.40	12.97	13.97	0.97	Factory compound	Flat land
No. 8+910	R	12.10	12.70	13.21	14.21	2.11	Housing area	Hilly land
	L	13.20	13.20	13.21	14.21	1.01	Petron Terminal	Flat land
No. 9+075	R	12.00	12.70	13.23	14.23	2.23	Housing area	Flat land
	L	13.20	13.40	13.23	14.23	1.03	Petron Terminal	Flat land
No. 9+225	R	12.00	12.70	13.24	14.24	2.24	Housing area	Flat land
	L	13.00	13.40	13.24	14.24	1.24	Factory compound	Flat land
No. 9+475	R	12.40	13.00	13.25	14.25	1.85	Factory compound	Flat land
	L	12.60	13.40	13.25	14.25	1.65	Factory compound	Flat land
No. 9+695	R	13.20	12.50	13.27	14.27	1.07	Factory compound (Marcere Steel)	Flat land
	L	13.40	13.30	13.27	14.27	0.87	Housing area	Flat land
No. 10+495	R	13.80	13.80	13.33	14.33	0.53	Housing area	Flat land
	L	12.90	12.30	13.33	14.33	2.03	Market area (Sta Ana Market)	Flat land
No. 10+745	R	12.80	13.80	13.35	14.35	1.55	Housing area	Flat land
	L	11.80	11.80	13.35	14.35	2.55	Housing area	Flat land
No. 10+965	R	13.00	13.30	13.36	14.46	1.46	Factory compound (Phimco Industry)	Flat land
	L	13.90	13.90	13.36	14.46	0.56	Housing area	Flat land
No. 11+165	R	11.60	12.30	13.38	14.38	2.78	High school compound	Flat land
	L	12.90	12.90	13.38	14.38	1.48	Housing area	Flat land
No. 15+095	R	14.20	14.30	13.66	14.66	0.46	Factory compound	Hilly land
	L	13.10	13.70	13.66	14.66	1.56	Factory compound (Colgate)	Hilly land
No. 15+295	R	14.20	14.20	13.67	14.67	0.47	Congested housing area	Hilly land
	L	13.10	13.90	13.67	14.67	1.57	Congested housing area	Hilly land

表7．4－1(3/3) 堤内地の土地利用と地形

Station No.		Existing Elevation (1) Bank (m)	Existing Elevation (2) Ground (m)	Designed Elevation (3) H.W.L. (m)	Designed Elevation (4) Wall (m)	Designed Elevation (5) 4-1 (m)	Condition of Land Side Utilization	Condition of Land Side Topography
No. 15+495	R	14.40	15.10	13.68	14.68	0.28	Congested housing area	Hilly land
	L	12.30	13.70	13.68	14.68	2.38	Factory compound	Hilly land
No. 0+590	R	12.70	12.70	13.94	14.94	2.24	Factory compound	Hilly land
	L	12.90	13.40	13.94	14.94	2.04	Congested housing area	Flat land
No. 0+780	R	13.10	13.10	13.95	14.95	1.85	Open space	Hilly land
	L	13.20	13.10	13.95	14.95	1.75	Office compound (Pasig Manpower)	Flat land
No. 0+980	R	12.10	12.30	13.96	14.95	2.85	Factory compound	Hilly land
	L	13.20	13.10	13.96	14.95	1.75	Housing area	Flat land
No. 1+180	R	12.50	12.50	13.97	14.97	2.47	Housing area	Hilly land
	L	15.70	15.60	13.97	14.97	-	Housing area	Flat land
No. 2+145	R	15.80	15.70	14.02	15.02	-	Factory compound	Hilly land
	L	12.30	12.50	14.02	15.02	2.72	Factory compound	Flat land
No. 2+320	R	15.00	15.30	14.03	15.03	0.03	Open space	Hilly land
	L	13.40	13.40	14.03	15.03	1.63	Factory compound	Flat land
No. 2+510	R	13.00	13.00	14.04	15.04	2.04	Factory compound	Hilly land
	L	14.10	14.10	14.04	15.04	0.94	Housing area	Flat land
No. 2+710	R	14.70	14.80	14.05	15.05	0.35	Housing area	Hilly land
	L	15.40	15.40	14.05	15.05	-	Housing area	Flat land
No. 2+910	R	12.70	13.20	14.07	15.07	2.37	Housing area	Hilly land
	L	14.30	14.40	14.07	15.07	0.77	Housing area	Flat land
No. 3+100	R	13.00	13.10	14.08	15.08	2.08	Housing area	Hilly land
	L	15.00	15.00	14.08	15.08	0.08	Housing area	Flat land
No. 4+080	R	14.00	14.20	14.13	13.13	-	Open space	Hilly land
	L	12.40	12.30	14.13	13.13	0.73	Housing area	Flat land
No. 4+280	R	16.50	13.50	14.14	15.14	-	Housing area	Hilly land
	L	16.50	12.70	14.14	15.14	-	Housing area	Flat land
No. 4+470	R	12.00	12.00	14.15	15.15	3.15	Factory compound	Hilly land
	L	16.10	16.20	14.15	15.15	-	Factory compound	Flat land

表7．4—2　パシグ・マリキナ川改修プロジェクト最適案の工費詳細

1US$=132Yen=21.3Peso

Work Item	Feature	Unit	Quantity	Total (1000P)	Foreign Currency (1000P)	Local Currency (1000P)
1 River Improvement				718,313	611,645	106,668
River Mouth/San Juan C.	L=8735m			494,093	418,307	75,786
Preparatory Works		l/s	1	117,679	99,629	18,050
Excavation		cu.m	2,334,000	305,754	259,891	45,863
Parapet wall/River wall		cu.m	3,000	9,000	7,650	1,350
Revetment		sq.m	40,000	24,000	20,400	3,600
Steel sheet		sq.m	5,000	17,500	16,625	875
Reconst. Pandacan bridge	L=140m	sq.m	840	20,160	14,112	6,048
San Juan C./Napindan C.	L=9760m			159,750	137,259	22,491
Preparatory Works		l/s	1	45,750	39,309	6,441
Excavation		cu.m	300,000	37,500	31,875	5,625
Parapet wall/River wall		cu.m	10,000	30,000	25,500	4,500
Revetment		sq.m	60,000	36,000	30,600	5,400
Steel sheet		sq.m	3,000	10,500	9,975	525
Napindan C./M.C.G.S.	L=5580m			28,170	24,385	3,785
Preparatory Works		l/s	1	5,770	4,995	775
Excavation		cu.m	100,000	9,500	8,075	1,425
Embankment		cu.m	10,000	400	340	60
Parapet wall/River wall		cu.m	1,000	3,000	2,550	450
Revetment		sq.m	10,000	6,000	5,100	900
Steel sheet		sq.m	1,000	3,500	3,325	175
M.C.G.S. /Mangahan C.	L=1210m			17,520	15,312	2,208
Preparatory Works		l/s	1	2,920	2,552	368
Excavation		cu.m	100,000	6,900	5,865	1,035
Parapet wall/River wall		cu.m	1,000	3,000	2,550	450
Revetment		sq.m	2,000	1,200	1,020	180
Steel sheet		sq.m	1,000	3,500	3,325	175
Mangahan C./STA.7+425	L=790m			18,780	16,383	2,397
Preparatory Works		l/s	1	3,130	2,731	400
Excavation		cu.m	50,000	4,750	4,038	713
Embankment		cu.m	5,000	200	170	30
Parapet wall/River wall		cu.m	2,000	6,000	5,100	900
Revetment		sq.m	2,000	1,200	1,020	180
Steel sheet		sq.m	1,000	3,500	3,325	175
2 Marikina Control Gate Structure				138,600	116,147	22,453
Preparatory Works		l/s	1	23,100	19,358	3,742
Excavation		cu.m	30,000	7,000	5,950	1,050
Embankment		cu.m	6,000	300	255	45
Concrete		cu.m	22,000	62,000	52,700	9,300
Gate (10.1m*17.5m*2no.)		ton	300	46,200	37,884	8,316
Sub-Total(1+2)				856,913	727,792	129,121
3 Administration *1)		l/s	1	42,846	0	42,846
4 Engineering Services		l/s	1	127,800	115,020	12,780
5 Physical Cotingency *2)		l/s	1	102,756	84,281	18,475
6 Land Acquisition & Compensation		ha	7	160,000	0	160,000
Total(1+2+3+4+5+6)				1,290,315	927,093	363,222
7 Price Cotingency *3)				110,675	0	110,675
8 Grand Total				1,400,990	927,093	473,896

Notes:
1); 5% of main civil works(1+2)
2);10% of (1+2+3+4)
3); 0% for foreign currecy and 6% for local currency

表7．4—3　パシグ・マリキナ川改修プロジェクト工費支出計画

UNIT : THOUSAND US$

WORK ITEM	TOTAL			1991		1992		1993		1994		1995	
	TOTAL	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.
1. PREPARATORY WORKS	9,310	7,913	1,397	3,041	548	2,339	424	2,300	390	234	36	0	0
2. RIVER IMPROVEMENT WORKS	30,919	26,256	4,663	620	91	8,010	1,431	7,390	1,340	5,118	901	5,118	901
2.1 LOWER MARIKINA R. IMPVT.(M.C.G.S/STA.7+425)	1,421	1,240	181	620	91	620	91	0	0	0	0	0	0
2.2 CONST. OF MARIKINA CONTROL GATE STRUCTURE	5,422	4,544	878	0	0	2,272	439	2,272	439	0	0	0	0
2.3 PASIG R. IMPVT.(RIVER MOUTH/M.C.G.S.)	24,076	20,472	3,604	0	0	5,118	901	5,118	901	5,118	901	5,118	901
TOTAL OF 1.+2.	40,229	34,169	6,060	3,661	638	10,349	1,854	9,690	1,730	5,352	937	5,118	901
3. ADMINISTRATION	2,011	0	2,011	0	215	0	610	0	571	0	314	0	301
4. ENGINEERING SERVICES	6,000	5,400	600	1,080	120	1,080	120	1,080	120	1,080	120	1,080	120
TOTAL OF 1. TO 4.	48,240	39,569	8,671	4,741	973	11,429	2,584	10,770	2,421	6,432	1,371	6,198	1,322
5. PHYSICAL CONTINGENCY (10% of the above total)	4,824	3,957	867	474	97	1,143	258	1,077	242	643	137	620	132
6. LAND ACQUISISTION & COMPENSATION	7,512	0	7,512	0	2,504	0	2,504	0	2,504	0	0	0	0
TOTAL OF 1. TO 6.	60,576	43,526	17,051	5,215	3,574	12,571	5,347	11,846	5,167	7,075	1,509	6,818	1,454
7. PRICE CONTINGENCY (F.C.:0% L.C.:6%)	5,197	0	5,197	0	683	0	1,403	0	1,748	0	631	0	732
GRAND TOTAL	65,774	43,526	22,248	5,215	4,257	12,571	6,750	11,846	6,915	7,075	2,140	6,818	2,186

NOTE : Figures may not add up to totals due to rounding.
Currency conversion rates are 1.00 US$ = 132 Yen = 21.30 Peso.

表7．4—4　パシグ・マリキナ川改修プロジェクトの年平均便益の計算

Unit : million peso

FLOOD RETURN PERIOD	FLOOD DAMAGE W/O PRJOJECT	FLOOD DAMAGE W/ PRJOJECT	REDUCTION	AVERAGE	EXPECTATION	BENEFIT
				56.0	0.50000	28.0
2-yr.	112.0	0.0	112.0			
				219.1	0.30000	65.7
5-yr.	326.2	0.0	326.2			
				420.1	0.10000	42.0
10-yr.	513.9	0.0	513.9			
				757.2	0.05000	37.9
20-yr.	1,000.5	0.0	1,000.5			
				1,027.1	0.01667	17.1
30-yr.	1,053.7	0.0	1,053.7			
				526.8	0.01333	7.0
50-yr.	1,261.9	1,261.9	0.0			
				0.0	0.01000	0.0
100-yr.	1,440.6	1,440.6	0.0			
					TOTAL	197.7

表７．４－５　パシグ・マリキナ川改修プロジェクトのキャッシュフロー

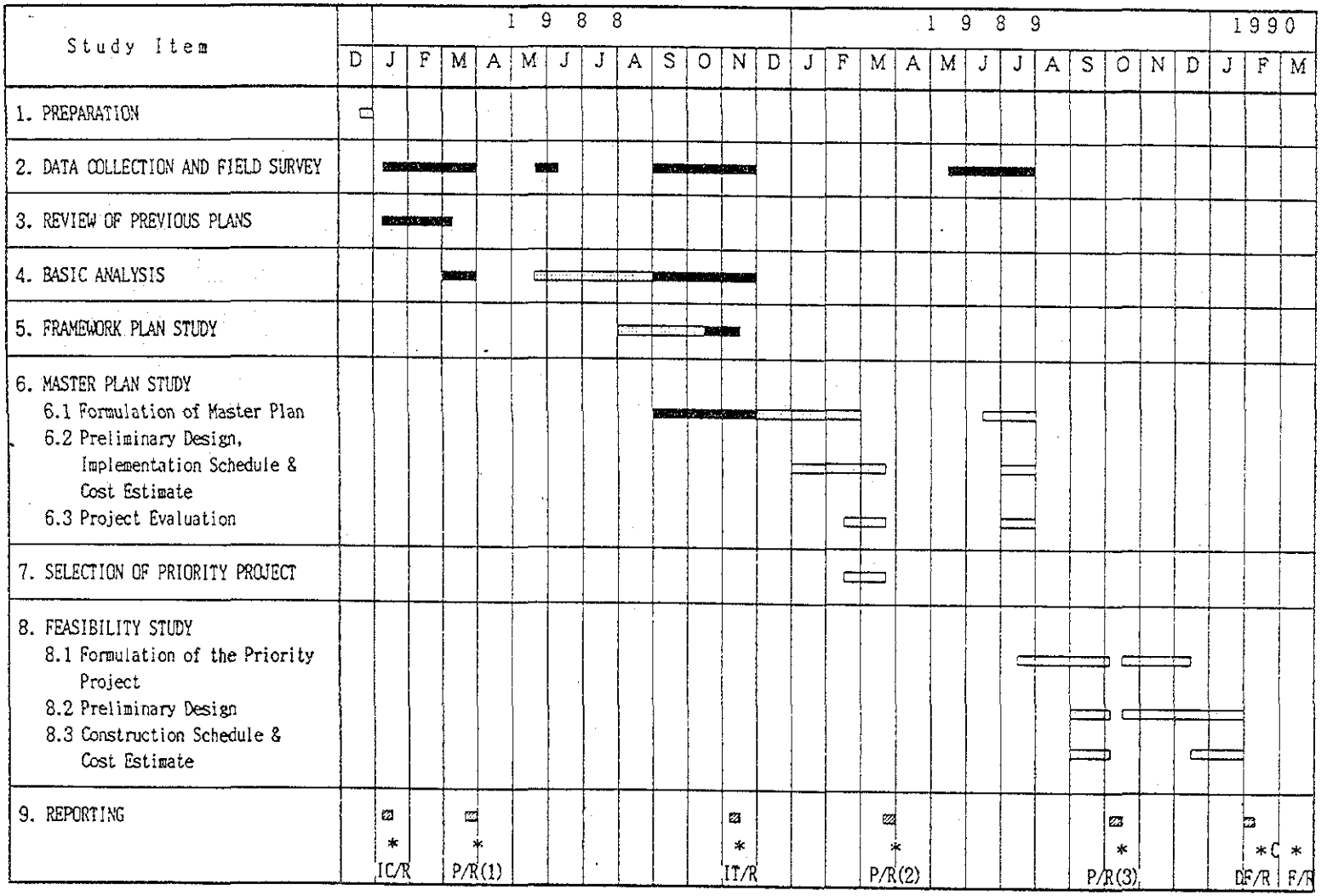
Unit : Million Peso

NO.	YEAR	ECONOMIC COST				ANNUAL AVERAGE BENEFIT	ANNUAL CASH FLOW
		CONSTRUC-TION	LAND ACQUISITION	OMR	TOTAL		
1	1991	120.5	53.3		173.8		(173.8)
2	1992	295.5	53.3		348.8	39.5	(309.3)
3	1993	278.2	53.3		331.5	79.1	(252.4)
4	1994	164.5			164.5	118.6	(45.9)
5	1995	158.6			158.6	158.2	(0.4)
6	1996			5.0	5.0	197.7	192.7
7	1997			5.0	5.0	197.7	192.7
8	1998			5.0	5.0	197.7	192.7
9	1999			5.0	5.0	197.7	192.7
10	2000			5.0	5.0	197.7	192.7
11	2001			5.0	5.0	197.7	192.7
12	2002			5.0	5.0	197.7	192.7
13	2003			5.0	5.0	197.7	192.7
14	2004			5.0	5.0	197.7	192.7
15	2005			5.0	5.0	197.7	192.7
16	2006			5.0	5.0	197.7	192.7
17	2007			5.0	5.0	197.7	192.7
18	2008			5.0	5.0	197.7	192.7
19	2009			5.0	5.0	197.7	192.7
20	2010			5.0	5.0	197.7	192.7
21	2011			5.0	5.0	197.7	192.7
22	2012			5.0	5.0	197.7	192.7
23	2013			5.0	5.0	197.7	192.7
24	2014			5.0	5.0	197.7	192.7
25	2015			5.0	5.0	197.7	192.7
26	2016			5.0	5.0	197.7	192.7
27	2017			5.0	5.0	197.7	192.7
28	2018			5.0	5.0	197.7	192.7
29	2019			5.0	5.0	197.7	192.7
30	2020			5.0	5.0	197.7	192.7
31	2021			5.0	5.0	197.7	192.7
32	2022			5.0	5.0	197.7	192.7
33	2023			5.0	5.0	197.7	192.7
34	2024			5.0	5.0	197.7	192.7
35	2025			5.0	5.0	197.7	192.7
36	2026			5.0	5.0	197.7	192.7
37	2027			5.0	5.0	197.7	192.7
38	2028			5.0	5.0	197.7	192.7
39	2029			5.0	5.0	197.7	192.7
40	2030			5.0	5.0	197.7	192.7
					IRR =	16.07%	
					B/C =	1.07	
					NPV =	56.54	

図

THE STUDY ON FLOOD CONTROL AND DRAINAGE PROJECT IN METRO MANILA, PHILIPPINES

JAPAN INTERNATIONAL COOPERATION AGENCY

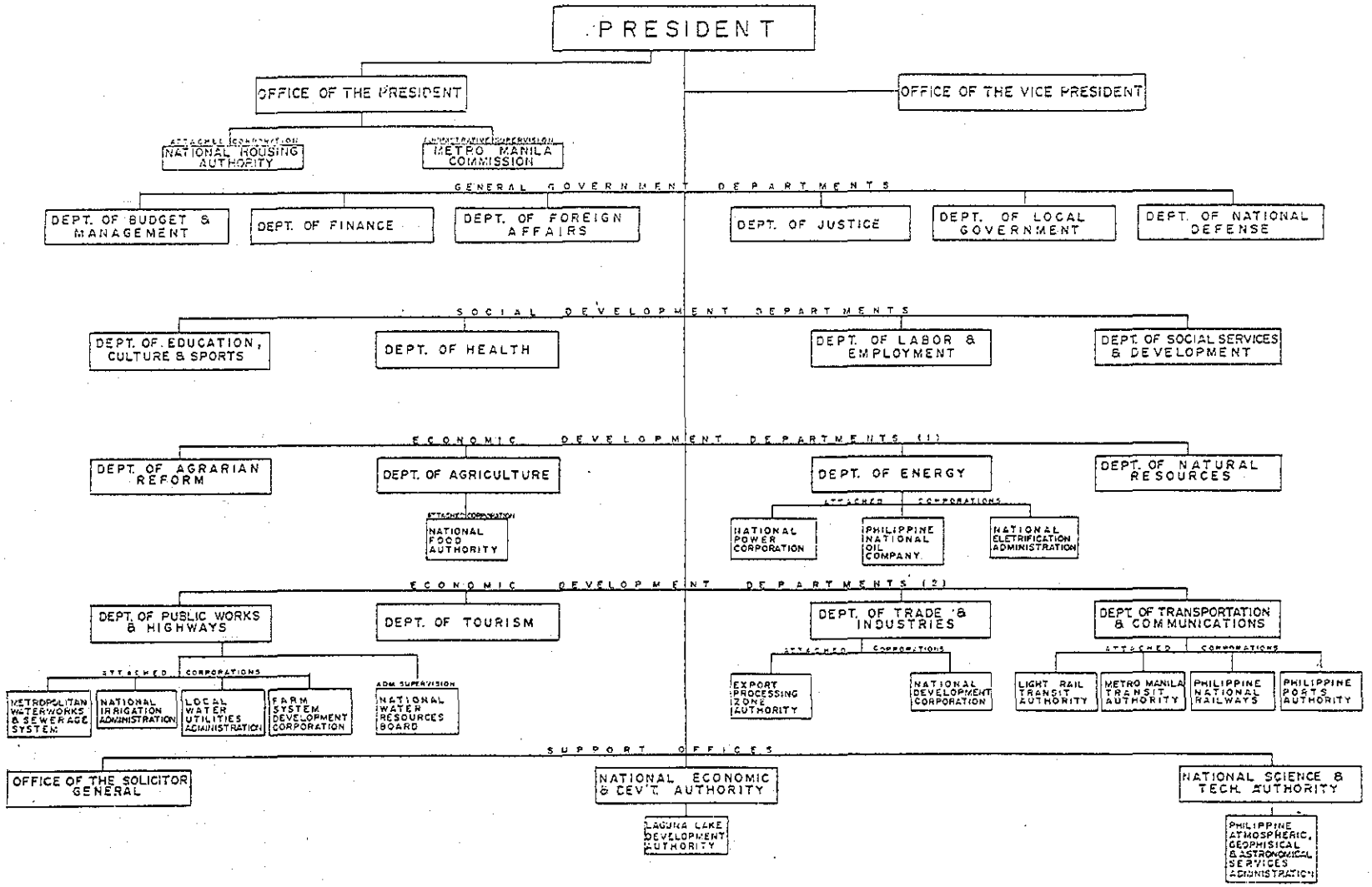


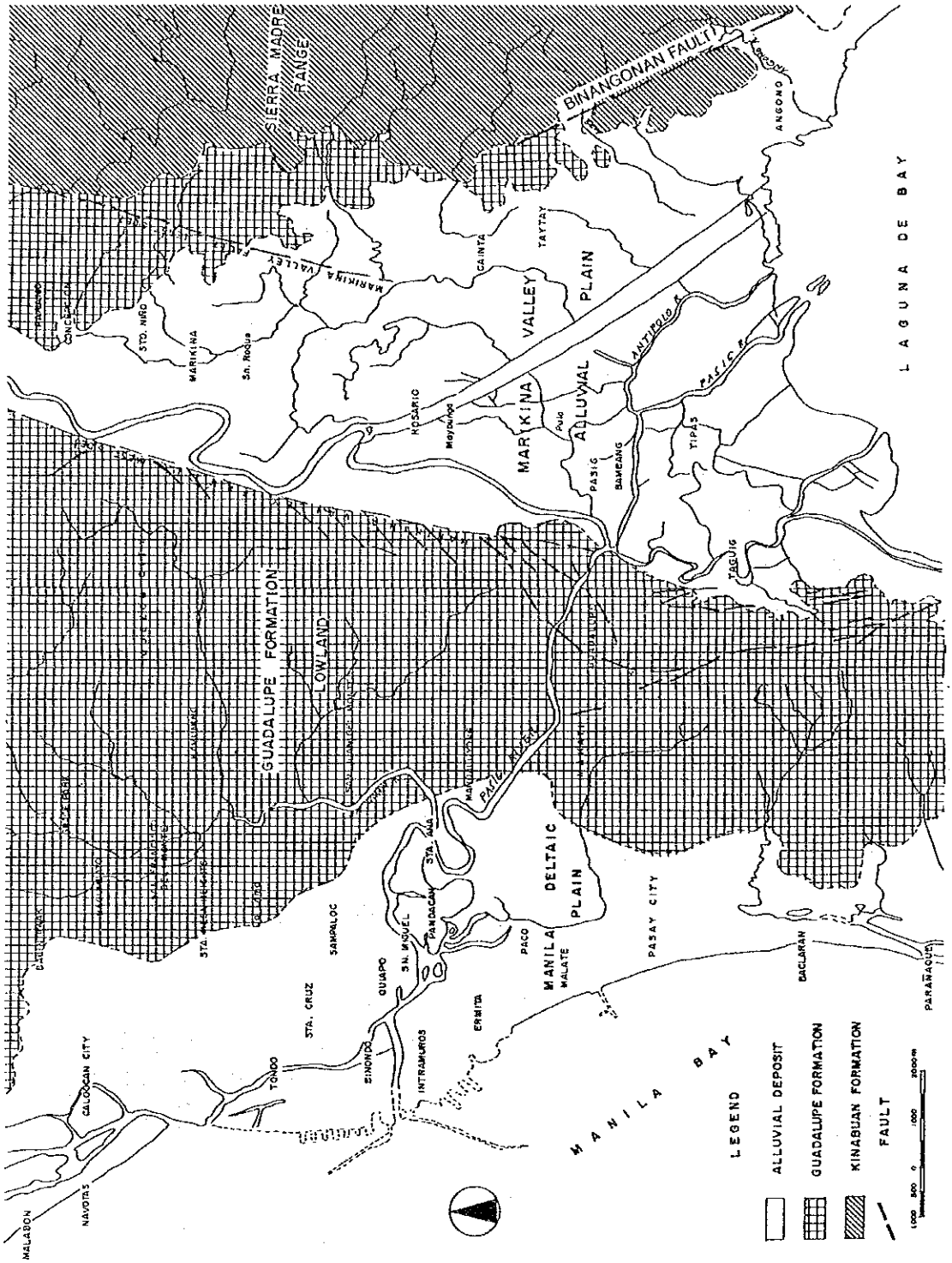
LEGEND

▬	: STUDY IN THE PROJECT SITE	IC/R	: INCEPTION REPORT	P/R(3)	: PROGRESS REPORT (3)
▭	: STUDY IN JAPAN	P/R(1)	: PROGRESS REPORT (1)	DF/R	: DRAFT FINAL REPORT
▨	: EXPLANATORY MEETING ON REPORT	IT/R	: INTERIM REPORT	F/R	: FINAL REPORT
*	: REPORT SUBMITTAL	P/R(2)	: PROGRESS REPORT (2)	C	: COMMENT

図 1.1-1 調査スケジュール

図 2. 2—1 政府組織図

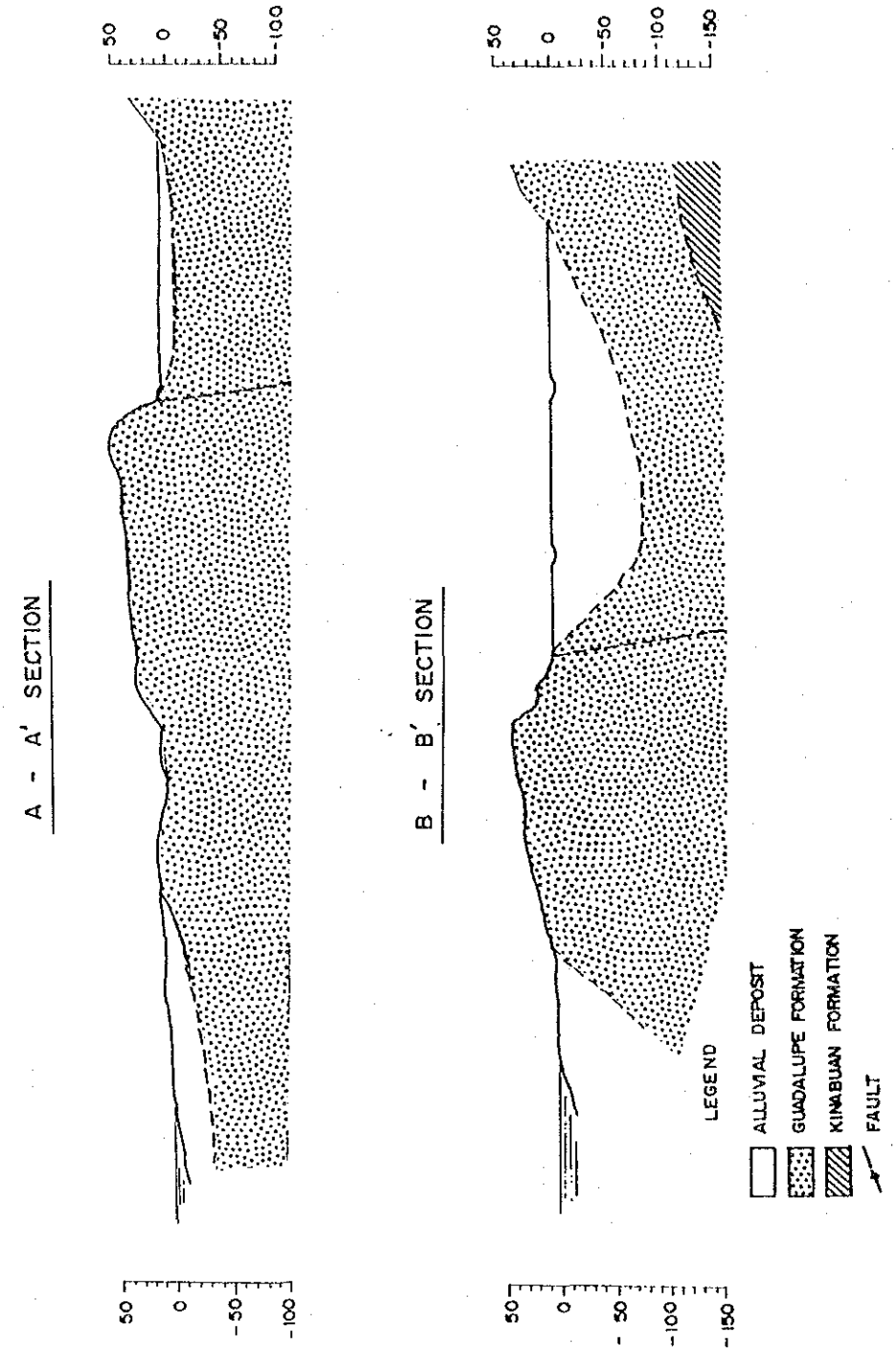

PRESIDENT
OFFICE OF THE PRESIDENT
OFFICE OF THE VICE PRESIDENT
ATTACHED CORPORATION
NATIONAL HOUSING AUTHORITY
ADMINISTRATIVE SUPERVISION
METRO MANILA COMMISSION
GENERAL GOVERNMENT DEPARTMENTS
DEPT. OF BUDGET & MANAGEMENT
DEPT. OF FINANCE
DEPT. OF FOREIGN AFFAIRS
DEPT. OF JUSTICE
DEPT. OF LOCAL GOVERNMENT
DEPT. OF NATIONAL DEFENSE
SOCIAL DEVELOPMENT DEPARTMENTS
DEPT. OF EDUCATION, CULTURE & SPORTS
DEPT. OF HEALTH
DEPT. OF LABOR & EMPLOYMENT
DEPT. OF SOCIAL SERVICES & DEVELOPMENT
ECONOMIC DEVELOPMENT DEPARTMENTS (1)
DEPT. OF AGRARIAN REFORM
DEPT. OF AGRICULTURE
ATTACHED CORPORATION
NATIONAL FOOD AUTHORITY
DEPT. OF ENERGY
ATTACHED CORPORATIONS
NATIONAL POWER CORPORATION
PHILIPPINE NATIONAL OIL COMPANY
NATIONAL ELETRIFICATION ADMINISTRATION
DEPT. OF NATURAL RESOURCES
ECONOMIC DEVELOPMENT DEPARTMENTS (2)
DEPT. OF PUBLIC WORKS & HIGHWAYS
DEPT. OF TOURISM
DEPT. OF TRADE & INDUSTRIES
DEPT. OF TRANSPORTATION & COMMUNICATIONS
ATTACHED CORPORATIONS
METROPOLITAN WATERWORKS & SEWERAGE SYSTEM
NATIONAL IRRIGATION ADMINISTRATION
LOCAL WATER UTILITIES ADMINISTRATION
FARM SYSTEM DEVELOPMENT CORPORATION
ADM. SUPERVISION
NATIONAL WATER RESOURCES BOARD
EXPORT PROCESSING ZONE AUTHORITY
NATIONAL DEVELOPMENT CORPORATION
LIGHT RAIL TRANSIT AUTHORITY
METRO MANILA TRANSIT AUTHORITY
PHILIPPINE NATIONAL RAILWAYS
PHILIPPINE POSTS AUTHORITY
SUPPORT OFFICES
OFFICE OF THE SOLICITOR GENERAL
NATIONAL ECONOMIC & DEV'T. AUTHORITY
LAGUNA LAKE DEVELOPMENT AUTHORITY
NATIONAL SCIENCE & TECH. AUTHORITY
PHILIPPINE ATMOSPHERIC, GEOPHYSICAL & ASTRONOMICAL SERVICES ADMINISTRATION



THE STUDY ON FLOOD CONTROL AND DRAINAGE PROJECT IN METRO MANILA, PHILIPPINES

JAPAN INTERNATIONAL COOPERATION AGENCY

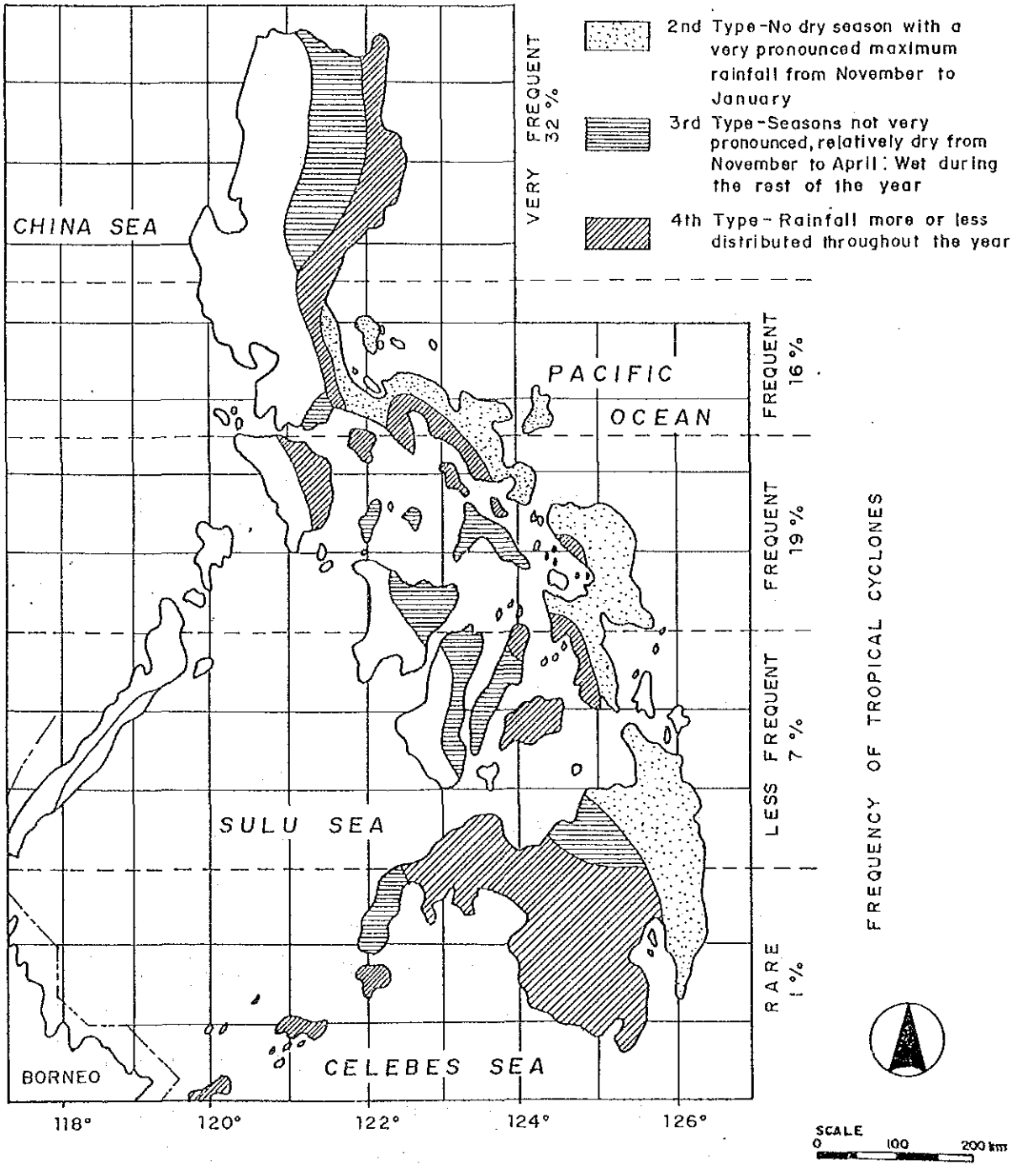
図2．4—1　調査対象地域の地質



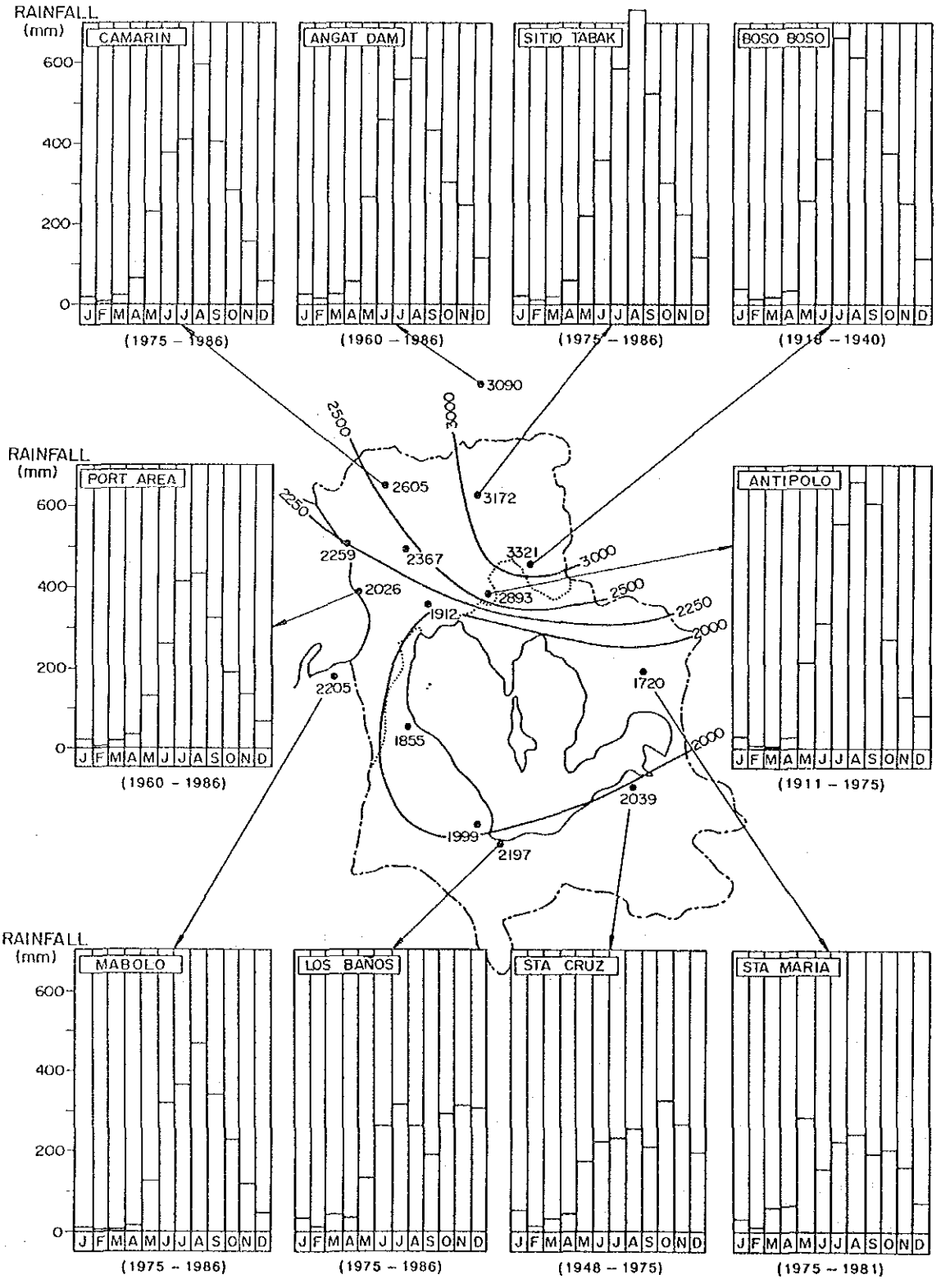
THE STUDY ON FLOOD CONTROL AND DRAINAGE PROJECT IN METRO MANILA, PHILIPPINES

JAPAN INTERNATIONAL COOPERATION AGENCY

図２．４—２　調査対象地域の地質横断



THE STUDY ON FLOOD CONTROL AND DRAINAGE PROJECT IN METRO MANILA, PHILIPPINES JAPAN INTERNATIONAL COOPERATION AGENCY	図2．5－1　フィリピンの気象区分

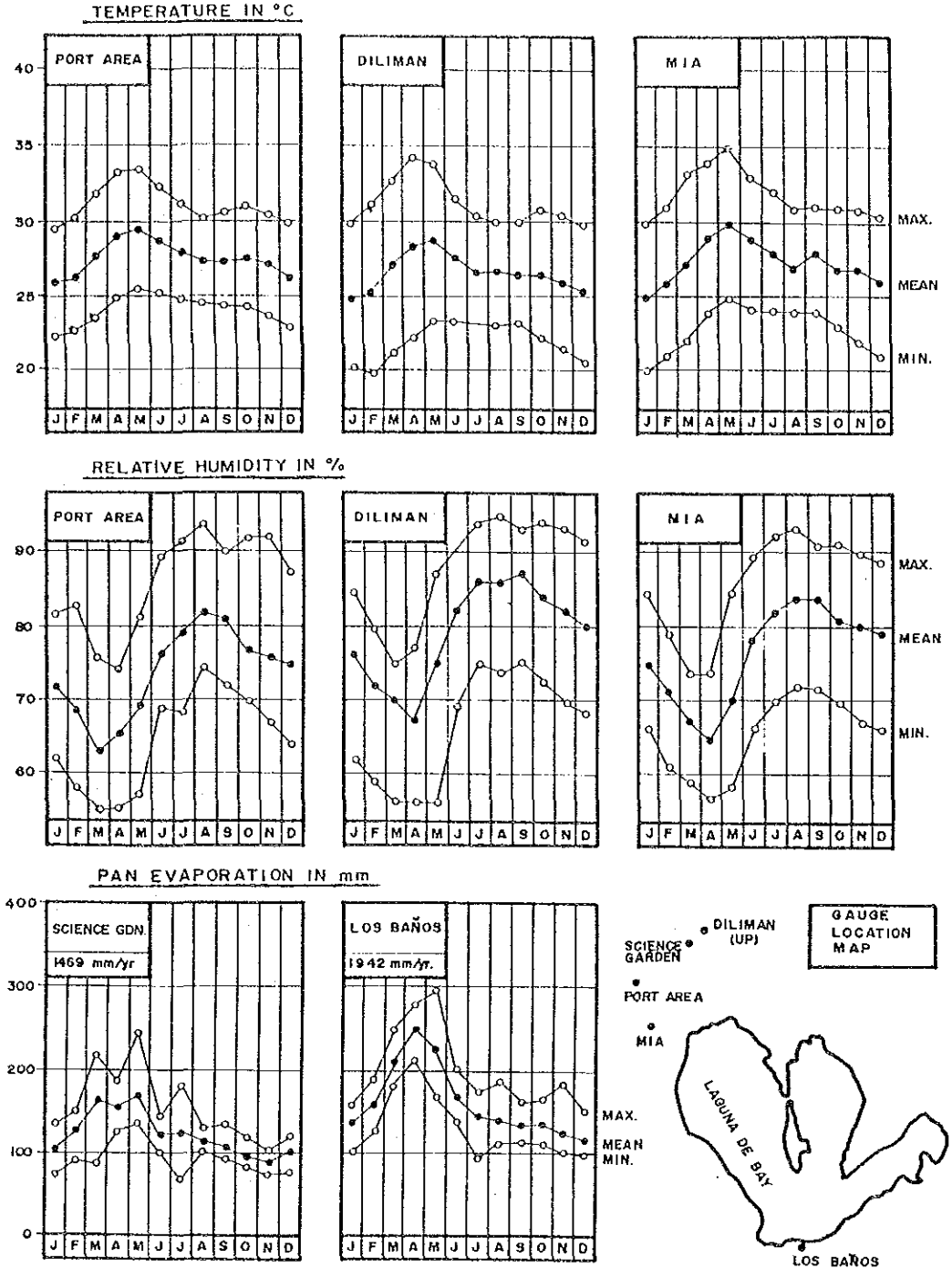


THE STUDY ON FLOOD CONTROL AND DRAINAGE PROJECT IN METRO MANILA, PHILIPPINES

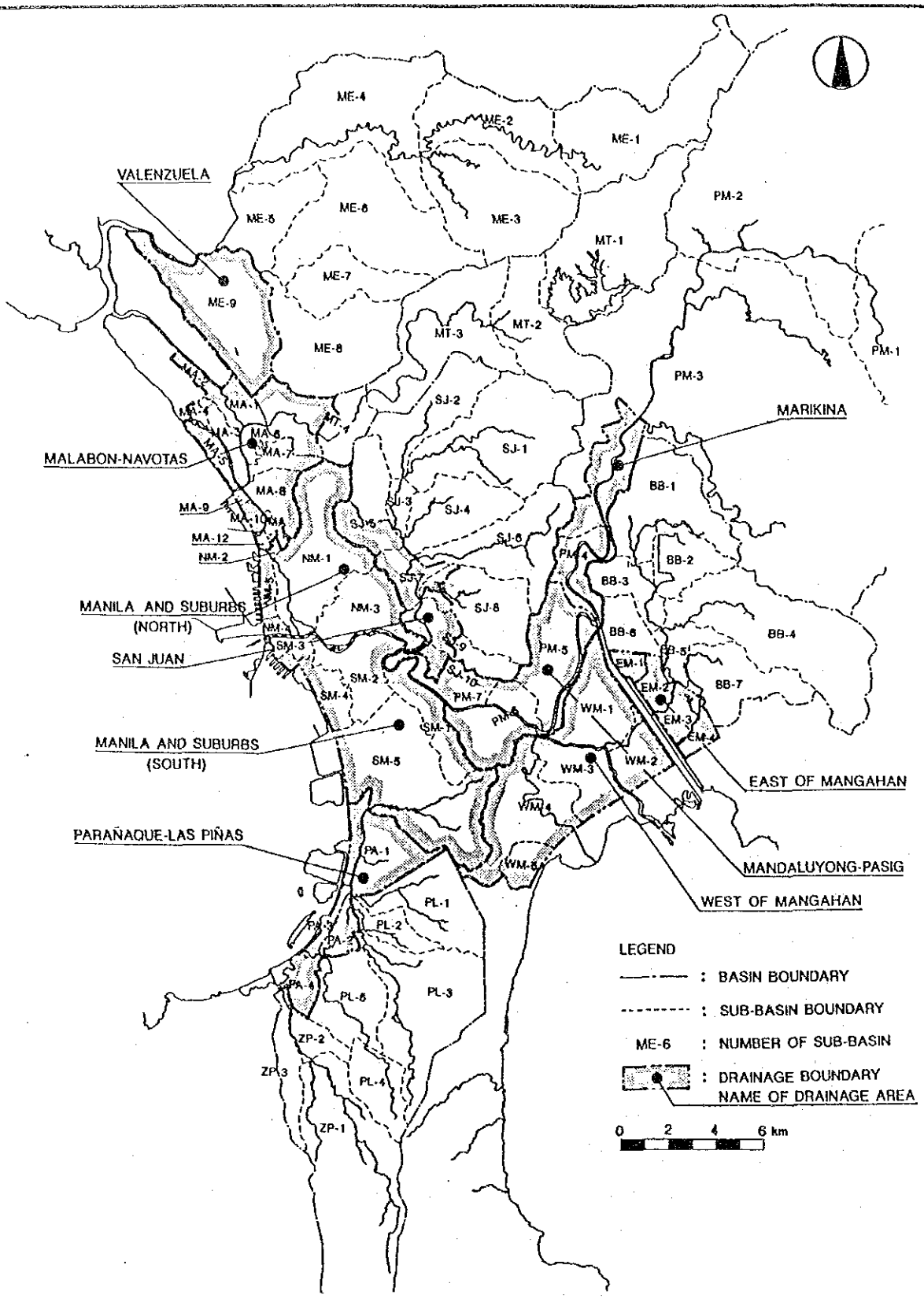
JAPAN INTERNATIONAL COOPERATION AGENCY

図２．５－２　等年雨量線と主要観測所の月雨量分布

Fig 2-4 MONTHLY VARIATION OF TEMPERATURE RELATIVE HUMIDITY AND PAN EVAPORATION



THE STUDY ON FLOOD CONTROL AND DRAINAGE PROJECT IN METRO MANILA, PHILIPPINES	図２．５—３　気温、相対湿度及び蒸発量の月変動
JAPAN INTERNATIONAL COOPERATION AGENCY	



THE STUDY ON FLOOD CONTROL AND DRAINAGE PROJECT IN METRO MANILA, PHILIPPINES

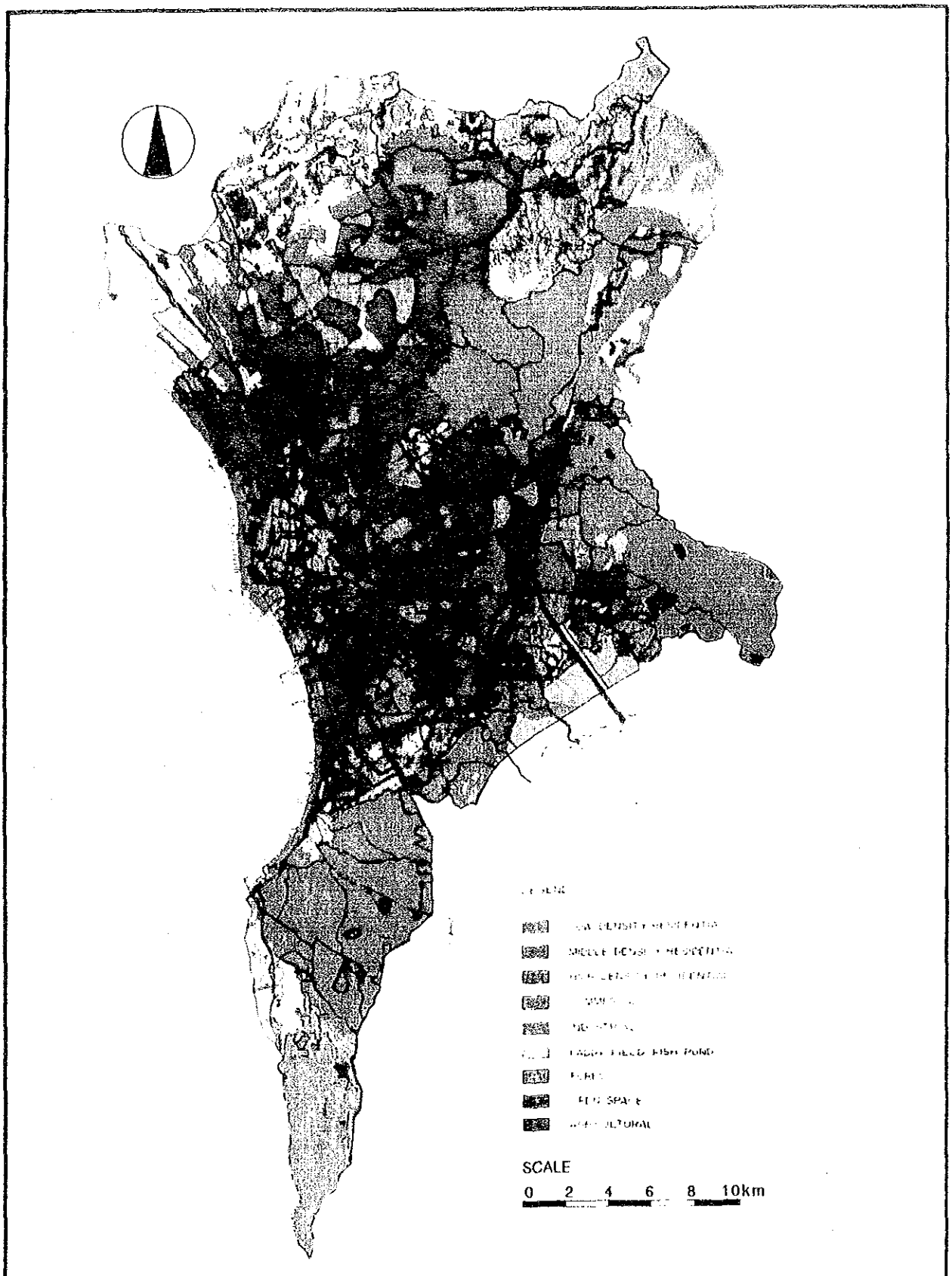
JAPAN INTERNATIONAL COOPERATION AGENCY

図３．１—１　調査対象地域の排水域

THE STUDY ON FLOOD CONTROL AND DRAINAGE PROJECT IN METRO MANILA, PHILIPPINES

JAPAN INTERNATIONAL COOPERATION AGENCY

図3．1－2　　１９８６年土地利用図



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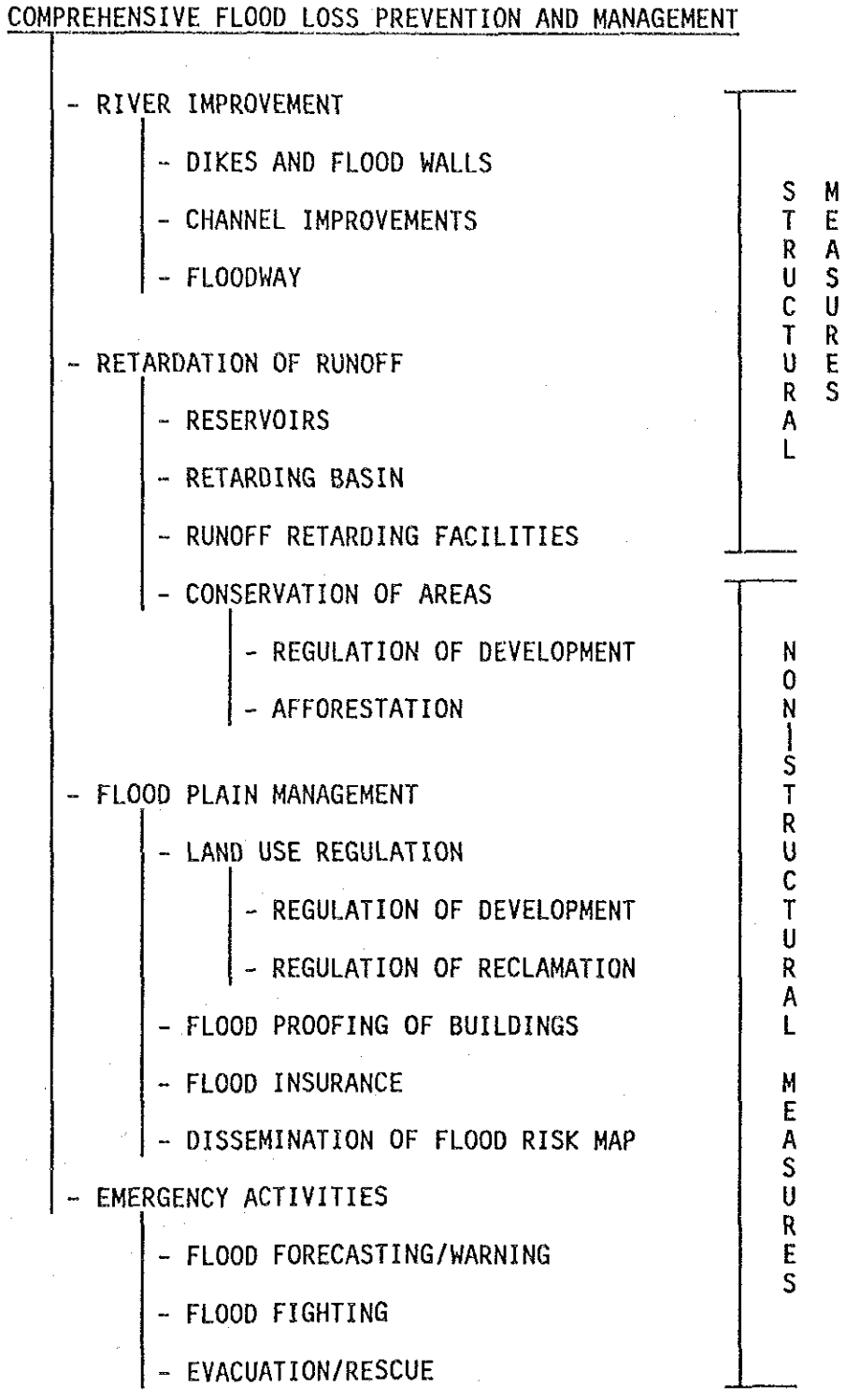
JAPAN INTERNATIONAL COOPERATION AGENCY

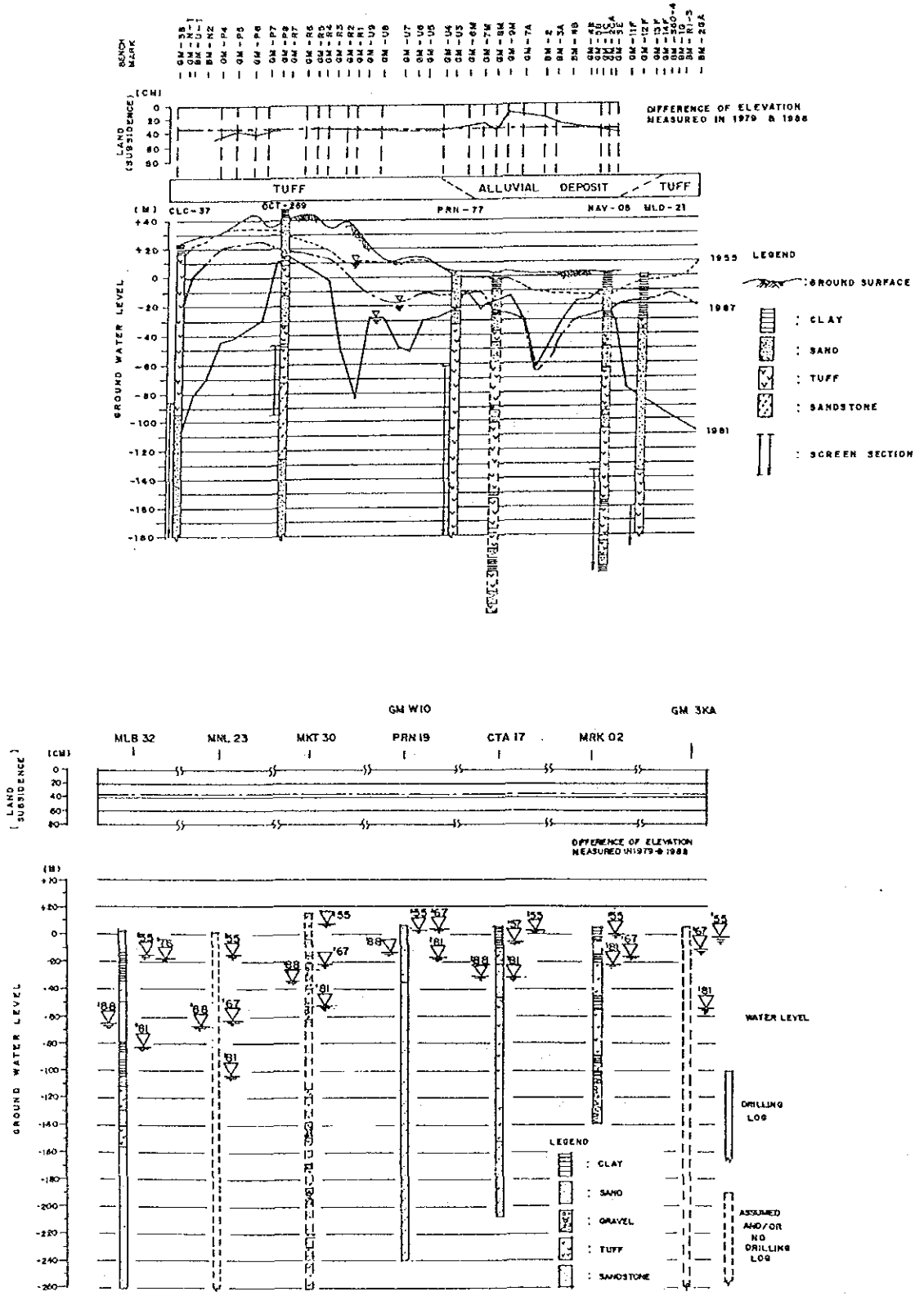
図3．1－3　　２０２０年土地利用図



THE STUDY ON FLOOD CONTROL AND DRAINAGE PROJECT IN METRO MANILA, PHILIPPINES

JAPAN INTERNATIONAL COOPERATION AGENCY

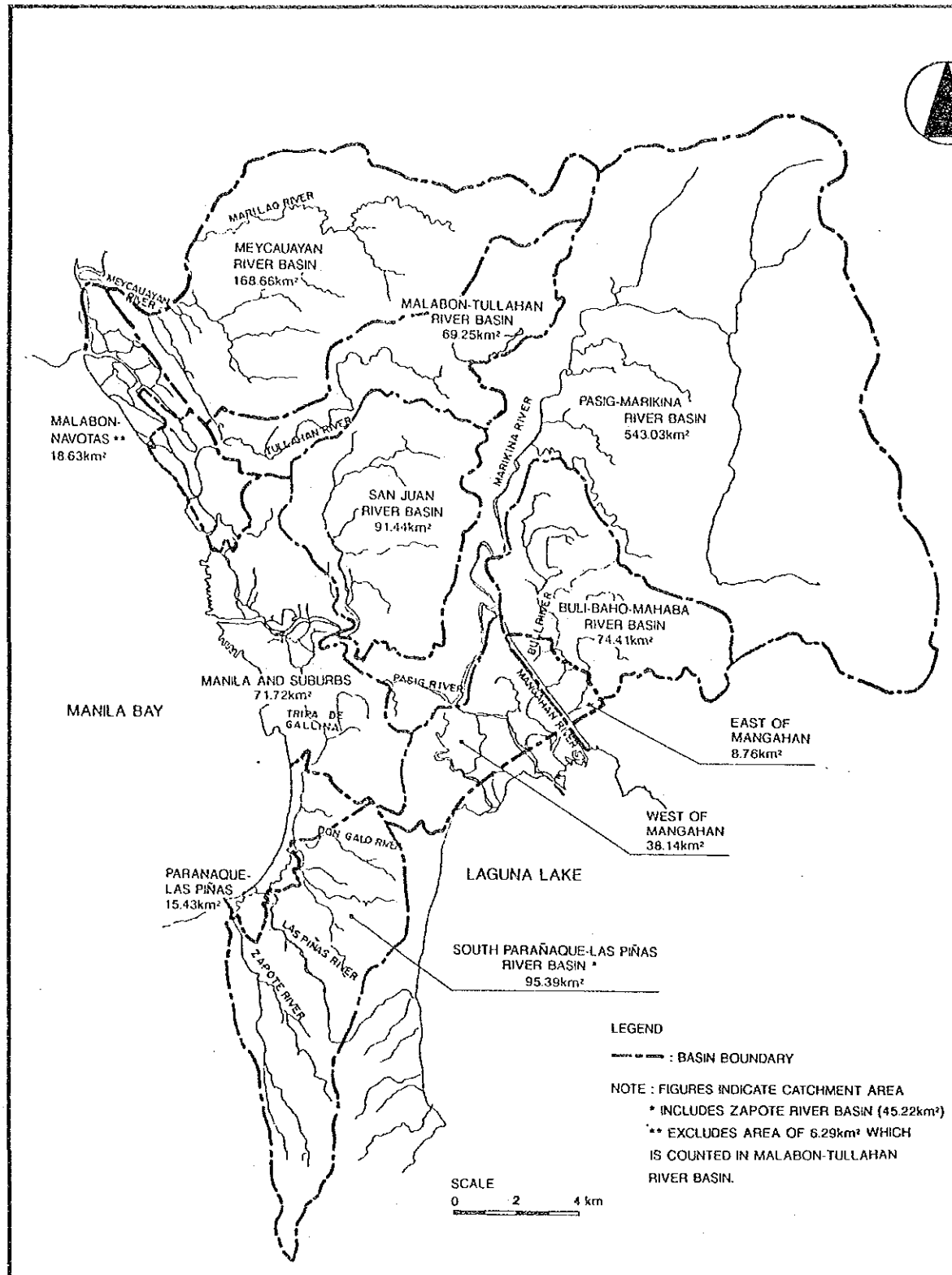
図３．２—１　総合治水対策の構成要素



THE STUDY ON FLOOD CONTROL AND DRAINAGE PROJECT IN METRO MANILA, PHILIPPINES

JAPAN INTERNATIONAL COOPERATION AGENCY

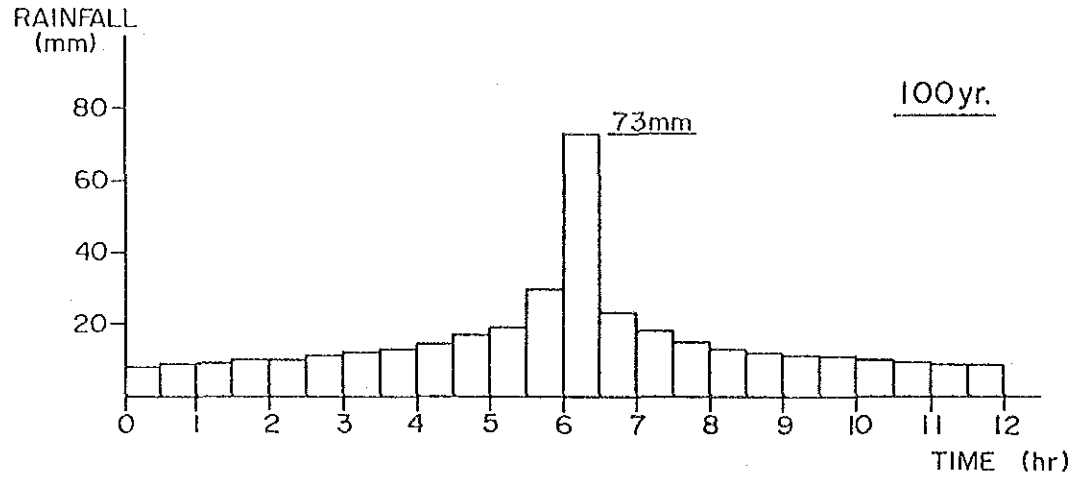
図3．3—1　測量結果と地下水位の変動

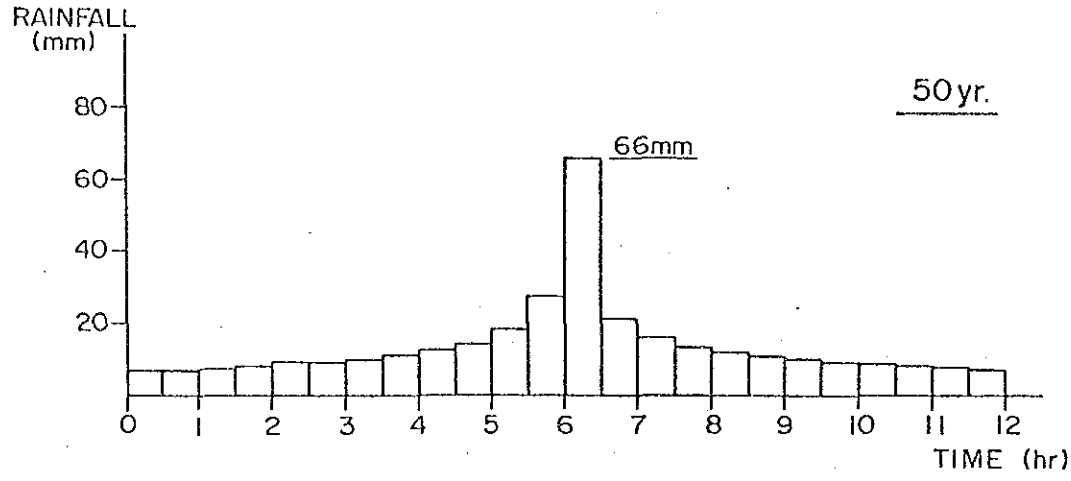


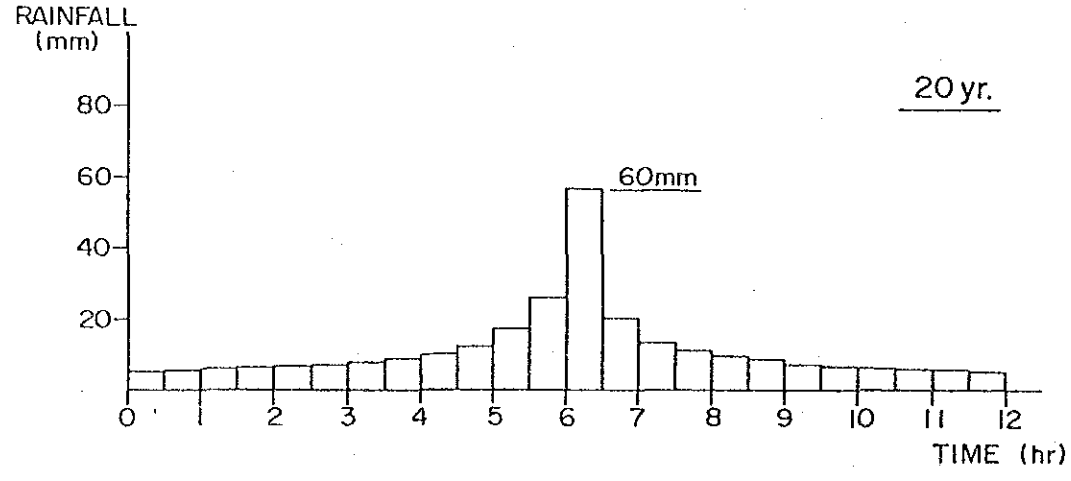
THE STUDY ON FLOOD CONTROL AND DRAINAGE PROJECT IN METRO MANILA, PHILIPPINES

JAPAN INTERNATIONAL COOPERATION AGENCY

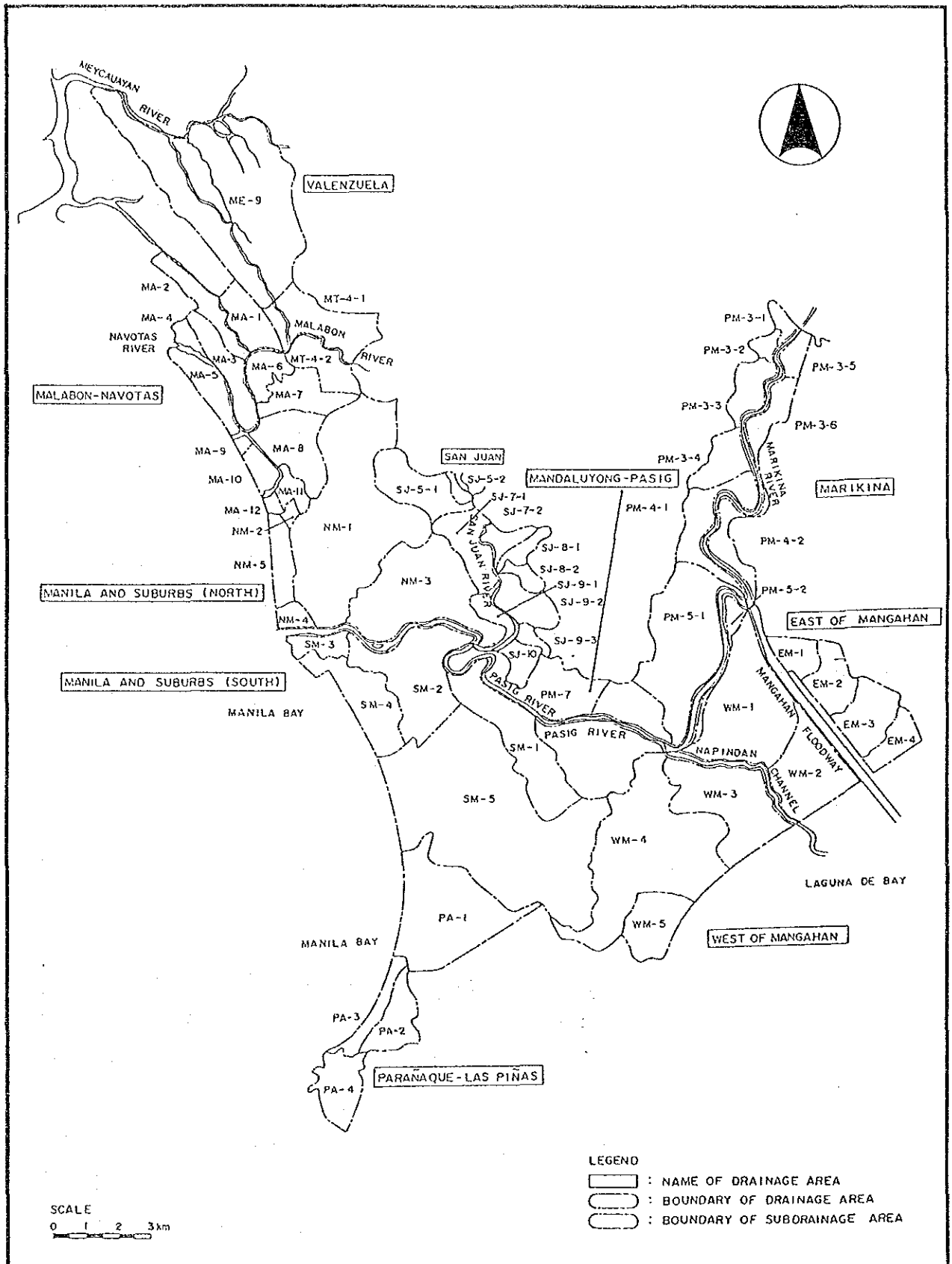
図３．４－１　調査対象地域の流域区分







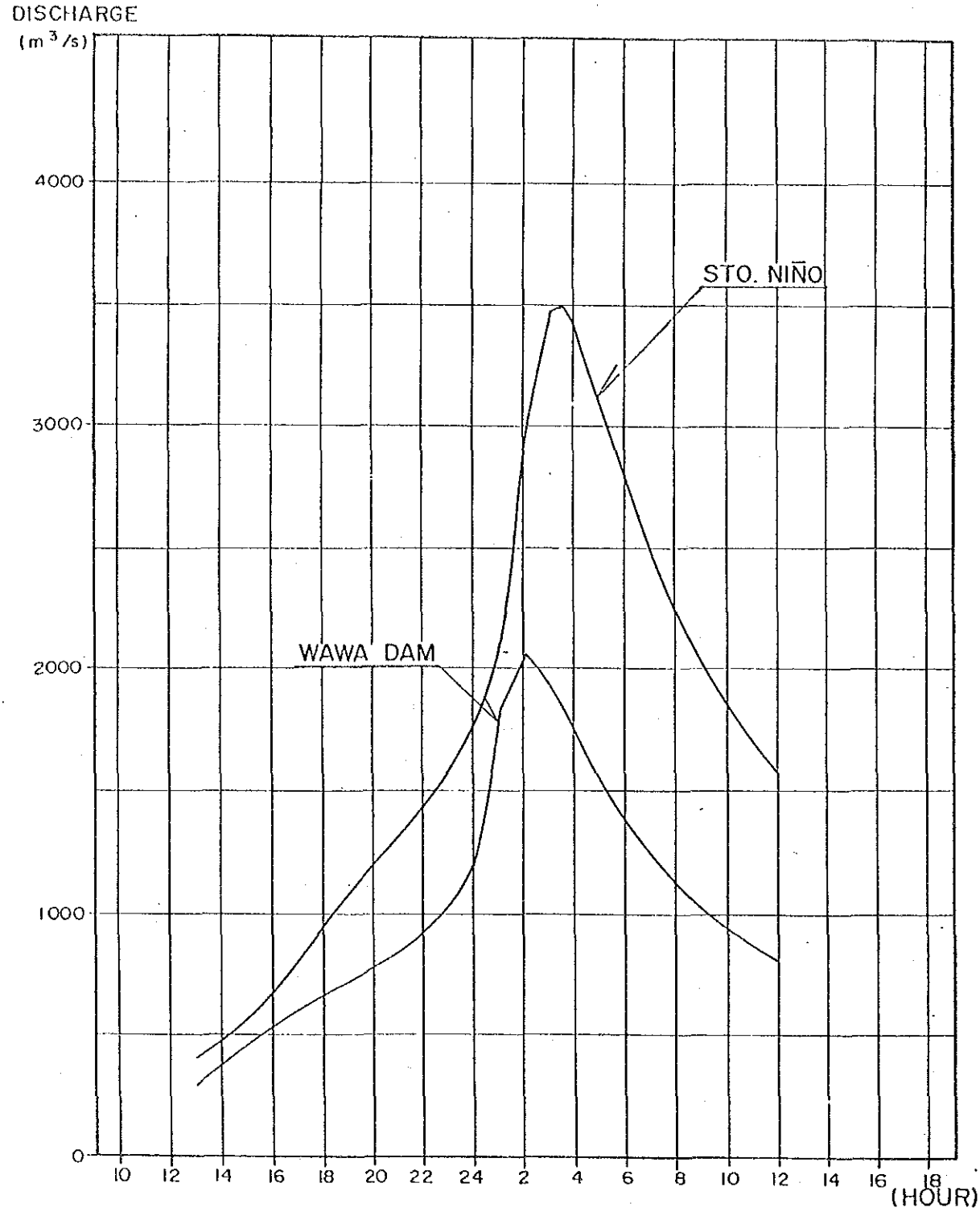
THE STUDY ON FLOOD CONTROL AND DRAINAGE PROJECT IN METRO MANILA, PHILIPPINES JAPAN INTERNATIONAL COOPERATION AGENCY	図3．4—2　ポートエリア観測所の計画降雨波形



THE STUDY ON FLOOD CONTROL AND DRAINAGE PROJECT IN METRO MANILA, PHILIPPINES

JAPAN INTERNATIONAL COOPERATION AGENCY

図3．4—3　調査対象地域の小排水域区分

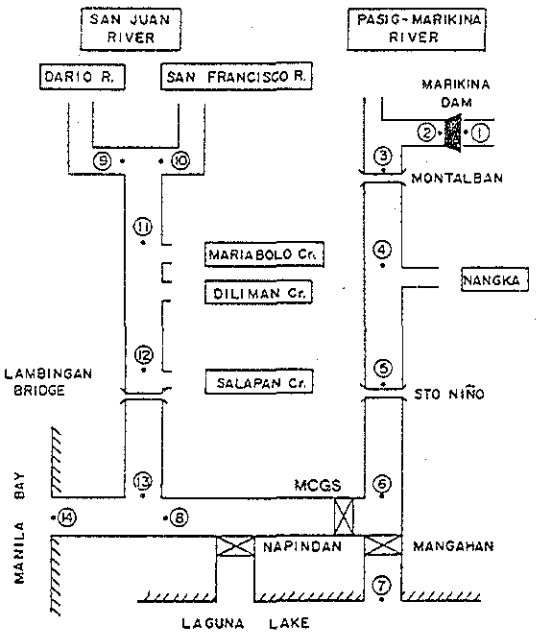


THE STUDY ON FLOOD CONTROL AND DRAINAGE PROJECT IN METRO MANILA, PHILIPPINES

JAPAN INTERNATIONAL COOPERATION AGENCY

図３．４—４　貯留関数法によるマリキナ川の１００年確率流量波形

図 3. 4－5 (1/3) 2020年土地利用下の河川流域の確率流量



PASIG-MARIKINA RIVER BASIN
(INCL. SAN JUAN RIVER BASIN)

W/O MARIKINA DAM & W/O MCGS

UNIT: m^3/s

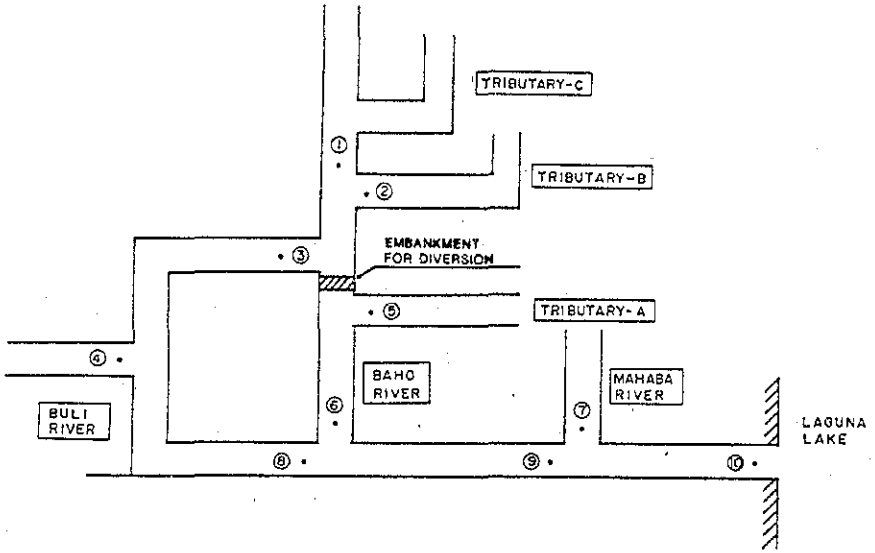
Point No.	RETURN PERIOD						
	100	50	30	20	10	5	2
①	2000	1800	1700	1600	1400	1200	1000
②	2000	1800	1700	1600	1400	1200	1000
③	2700	2450	2250	2100	1900	1600	1300
④	3050	2800	2550	2400	2100	1750	1400
⑤	3500	3200	2900	2800	2400	2050	1600
⑥	3500	3200	2900	2800	2400	2050	1600
⑦	2250	2000	1850	1750	1450	1200	900
⑧	1200	1100	1000	950	850	750	600
⑨	250	230	230	220	210	200	190
⑩	390	380	370	350	330	320	310
⑪	630	600	600	570	540	520	490
⑫	820	790	780	750	700	670	610
⑬	900	860	850	810	740	700	630
⑭	1500	1350	1200	1150	1000	900	750

W/ MARIKINA DAM & W/ MCGS

UNIT: m^3/s

Point No.	RETURN PERIOD						
	100	50	30	20	10	5	2
①	2000	1800	1700	1600	1400	1200	1000
②	1500	1400	1300	1250	1200	1000	900
③	2050	1900	1800	1700	1550	1300	1200
④	2600	2400	2200	2100	1900	1600	1400
⑤	2900	2700	2500	2400	2100	1800	1550
⑥	2900	2700	2500	2400	2100	1800	1550
⑦	2400	2000	2200	1900	1600	1300	1050
⑧	500	290	100	80	65	50	30
⑨	250	230	230	220	210	200	190
⑩	390	380	370	350	330	320	310
⑪	630	600	600	570	540	520	490
⑫	820	790	780	750	700	670	610
⑬	900	860	850	810	740	700	630
⑭	950	860	800	750	660	570	420

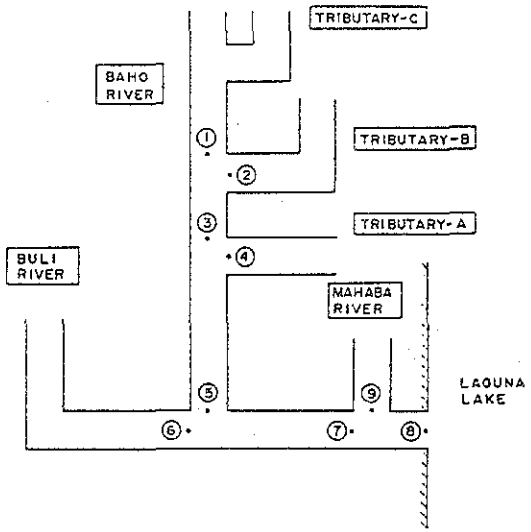
図 3. 4－5 (2/3) 2020年土地利用下の河川流域の確率流量



BULI-BAHO-MAHABA RIVER BASIN
W/ SHORT CUT

UNIT : m³/s

Point No.	RETURN PERIOD						
	100	50	30	20	10	5	2
①	280	250	230	225	210	190	170
②	110	100	95	90	85	80	70
③	280	250	230	225	210	190	170
④	80	75	70	65	60	55	50
⑤	280	250	230	225	210	190	170
⑥	335	300	275	270	250	230	190
⑦	190	170	160	150	140	130	120
⑧	330	295	270	260	245	210	180
⑨	495	450	410	395	365	320	260
⑩	530	475	430	415	380	330	260



BULI-BAHO-MAHABA RIVER BASIN
W/O SHORT CUT

UNIT : m³/s

Point No.	RETURN PERIOD						
	100	50	30	20	10	5	2
①	280	250	230	225	210	190	170
②	110	100	95	90	85	80	70
③	280	250	230	225	210	190	170
④	280	250	230	225	210	190	170
⑤	520	470	430	420	390	350	290
⑥	120	110	100	95	90	85	80
⑦	530	480	440	420	390	350	290
⑧	570	510	470	450	410	360	290
⑨	190	170	160	150	140	130	120

SOUTH PARAÑAQUE-LAS PIÑAS RIVER BASIN

UNIT : m^3/s

Point No.	RETURN PERIOD						
	100	50	30	20	10	5	2
①	630	560	520	490	440	380	320
②	200	180	170	160	140	120	100
③	370	330	300	290	260	220	190
④	430	380	350	330	300	260	220
⑤	220	200	180	170	160	140	120

MALABON-TULLAHAN RIVER BASIN

UNIT : m^3/s

Point No.	RETURN PERIOD						
	100	50	30	20	10	5	2
①	400	370	365	340	310	290	250
②	240	220	210	200	180	160	140
③	330	300	290	270	240	220	190
④	480	430	420	390	340	300	240
⑤	520	470	450	420	360	320	250

THE STUDY ON FLOOD CONTROL AND DRAINAGE PROJECT IN METRO MANILA, PHILIPPINES

JAPAN INTERNATIONAL COOPERATION AGENCY

図3．4－5(3/3) ２０２０年土地利用下の河川流域の確率流量